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DECEMBER 6, 1954

American Machinist

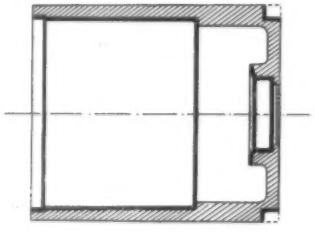
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Alcoa's bandsaw . . . see page 2

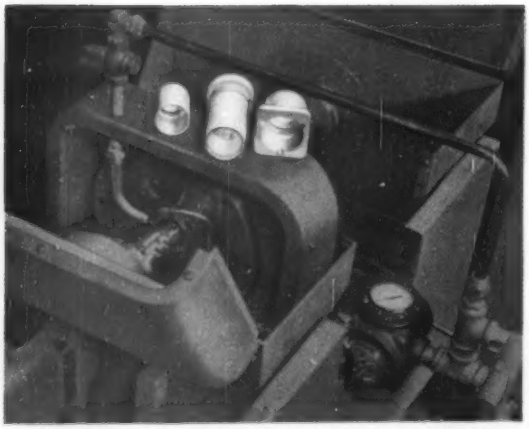
How to Prevent Rust and Corrosion— A SPECIAL REPORT

Forming and Welding Ti • Photos Guide Shopmen

HOME TO A NEEDLE IN A HAYSTACK



. . . a little sooner, a little surer because navigation instrument parts like this were BORIZED*



This model 122 Heald Bore-Matic bores, plunge faces, turns and chamfers six different end bells for a manufacturer of precision aircraft instruments.

Double end machine finishes both ends of part in sequence in a high-speed automatic cycle. After work is loaded in air-operated chuck, table traverses left to bore and plunge face one end of part, then reverses right to perform similar operations on the opposite end. Turning operations, when required, are performed in a similar cycle.

WAR OR PEACE, preparedness is a twenty-four-hour job. If you're a carrier pilot, that flight deck looks mighty good after you've been out on a long mission. To find it, on a limitless expanse of ocean, calls for some pretty precise navigation.

That's why the highest standards of accuracy and precision are rigidly maintained in every step of aircraft instrument manufacture—military or civilian. Heald borizing of the instrument end bells, as shown here, assures consistent, uniform production that's well within specified tolerances.

Whenever a part is precision finished on a Heald Internal, Rotary Surface Grinder or Bore-Matic, you can be sure of three things. A longer-lasting precision-made part. Substantial savings in time and production cost. And a definite competitive advantage for your product.

IT PAYS TO COME TO HEALD!

Precision finished by a Heald engineered method on a Heald Bore-Matic.

THE HEALD® MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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chips

DONE BY MIRRORS . . . Alcoa is putting into operation, at Lafayette, Ind, the largest extrusion press (14,000 tons) in the US. It, an accompanying 1500-ton stretchpress, a 52 X 52-in. die saw, a 23-in.-stroke die filer and a 96-in. cold saw are five machines—all the biggest to date. The die saw, with remote control by wheel from a driver's seat, is perhaps the strangest of the four, so it is our cover picture. The operator steers by mirrors, with gages to report condition. It, and the other four, are described and pictured in an article in this issue.

OLD MAN RUST . . . We have been collecting, for some time, data on rust and corrosion and how to stop them. It was a personal project of our rust-headed associate editor, Chas Emerson, and he boils the essential parts into 16 full pages to make our current Special Report. He tells what corrosion is, how it forms, where it *helps*, where it harms, and the various ways to combat it.

FOR MANAGEMENT . . . Our lead article is a bit unusual, but important. It covers a critical problem—how to get your ideas up and down in your organization—by showing how people differ in the way they must be reached. Better see if it applies in your case. . . . There's also a page showing how you get results from foreman training.

PICTURES . . . Harry Friedman, foreman at Wheeler Service, Cambridge, Mass, sent this one to us out of the blue. He uses a camera to record setups, special jobs, mechanisms, maintenance problems, safety hazards. Here is an idea from a thinking foreman.

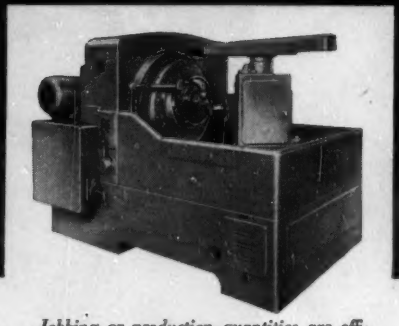
FORMING TI . . . Ryan Aeronautical had an Air Force test contract to find ways and means of forming and welding titanium. From these test results, we have drawn best techniques tools, speeds, and ideas on what to avoid. . . . For contrast, E M Miekley of Westinghouse describes an ingenious setup for silver-brazing root ends to blades for steam turbines, using gas burners.

SHORT-RUN TOOLING . . . Glenn L Martin Co, Baltimore, has developed a master setup plate and 3-point positioning system for tooling short-run work. We bring you details, mostly in pictures. There are sizeable savings of downtime by this technique.

DON'T FAIL TO SEE . . . You should—or will shortly—have your 1955 Production Planbook. There's a 128-page Special Report, "How to Work Steel," the equivalent of a 500-page book but much more up-to-date. There's also our first set of "Nuggets," that must be seen to be believed—a year's new developments, classified in 135 quick pages.

COMING . . . Dec 20 *AM* will include your Christmas present, an 8-page foldout insert in three colors, showing how tools have been the basis of our civilization. It's really exceptional—and your children will want extra copies. There are also articles on metal-to-metal involute gears, on spot-welding titanium, a very unusual automation setup, an interesting study on weather vs accident frequency, and another instalment of Stanley Cope.

Alcoan . . . William C Winter, born and educated in Philadelphia, studied engineering at Lebanon Valley College, got his BS at Drexel Institute, later won a law degree. He joined Alcoa in 1919, was in charge of alloy-sheet manufacture at New Kensington ('20-'26), asst gen supt ('26-'29), supt at Edgewater, NJ ('29-'31), development of strong-sheet rolling at Alcoa, Tenn, ('31-'36), asst supt, Arnold, Pa ('36-'43), works manager DPC—owned extrusion and tube plant, Cressona, Pa ('43-'44), coordinator all Alcoa tube and extrusion manufacture ('44), administrative asst to gen mgr, Fabricating Div ('44-'46) supervising training. On June 1, '46, he became works manager of the tube and extrusion plant at Lafayette, Ind, where the big new press and auxiliaries he describes in our current article are installed.



Jobbing or production quantities are efficiently handled with the new Gleason No. 106 Hypoid Generator.

This new generator cuts medium-size bevel gears *faster than ever!*

Several things have been done to make this new Gleason No. 106 Hypoid Generator the fastest machine for producing medium-size bevel gears.

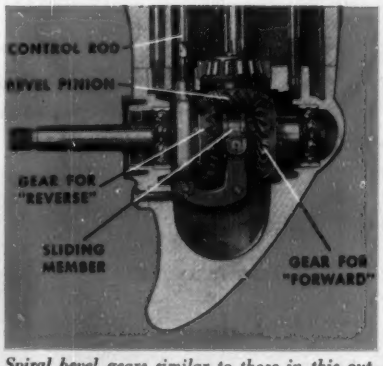
For example, new generating and feed mechanisms coupled with rigid construction give more efficient cutting cycles, speeding up cutting time. In addition, the new generating method assures excellent finish, and maximum cutter life.

Few adjustments required

Since fewer adjustments are necessary, faster setup and change-over are attained.

Extreme operating flexibility is one of the outstanding features of the 106. This permits its use for jobbing, production and completing. When it is arranged for completing, gears are finished directly from the solid blank.

This machine handles gears from 2″ to 8½″ diameter, 4DP and finer, with ratios up to 10/1, cone distances up to 5¼″. We will gladly send you more details on request.

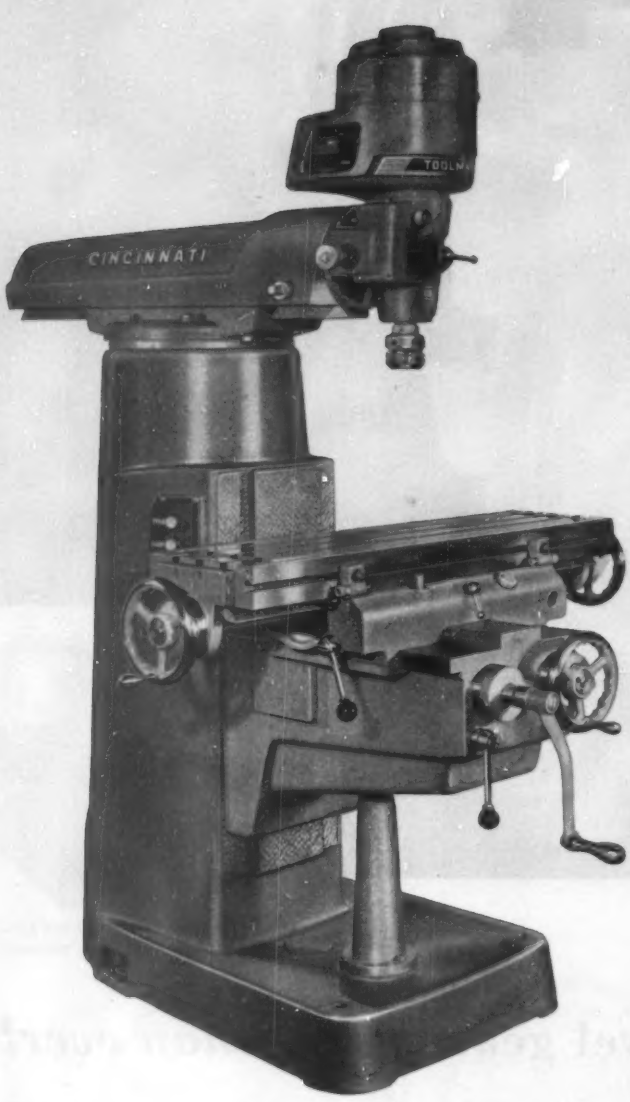


Spiral bevel gears similar to those in this outboard motor drive are cut accurately and quickly on this Gleason machine.

GLEASON WORKS

Builders of bevel gear machinery for over 85 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.



The new

has

New Cincinnati Toolmaster Milling Machine. Built in three styles:
1A — Manual feed to quill, 1 hp motor
1B — Power feed to quill, 1 hp motor
1C — Heavy duty head, 2 hp motor
Range: 16" table traverse, 10" cross, 17" vertical
Complete data in catalog No. M-1870.

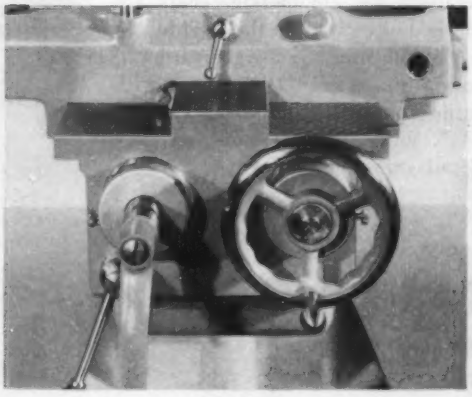
CINCIN

Quick pic story of Toolmaster features

CINCINNATI

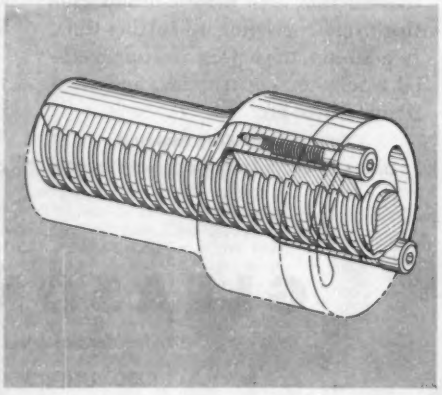
Extra Wide Knee

Has two advantages: wide square gibbed bearing ways for maximum strength; narrow guide for smooth cross adjustment.



Backlash Problem Solved

The anti-backlash device enables the operator to feed the table to the right or left as desired.



Toolmaster

everything

. . . and there's a good reason. Before a single drawing was put on paper, our market research engineers went into shops everywhere, asking what was wanted in a small manual feed toolroom milling machine. Operators, tool engineers, machine tool buyers, maintenance supervisors . . . all had a voice in the design of the new CINCINNATI Toolmaster. Yes, there's a very good reason why these new milling machines have everything desired for fast, low-cost milling operations in toolrooms, contract shops, tool and die shops, repair departments, and others. Just take a look at the five typical features illustrated below. They were operator-approved in actual field tests; management-approved in cost-of-production records. Would you like to have more information? Just write for new four-color catalog, No. M-1870.

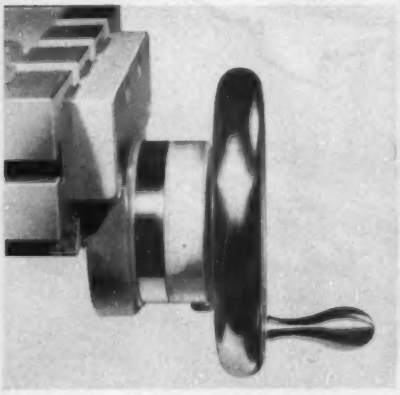
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Extra Large Dials

Graduation lines are large and legibly stamped; easy to match without eyestrain.



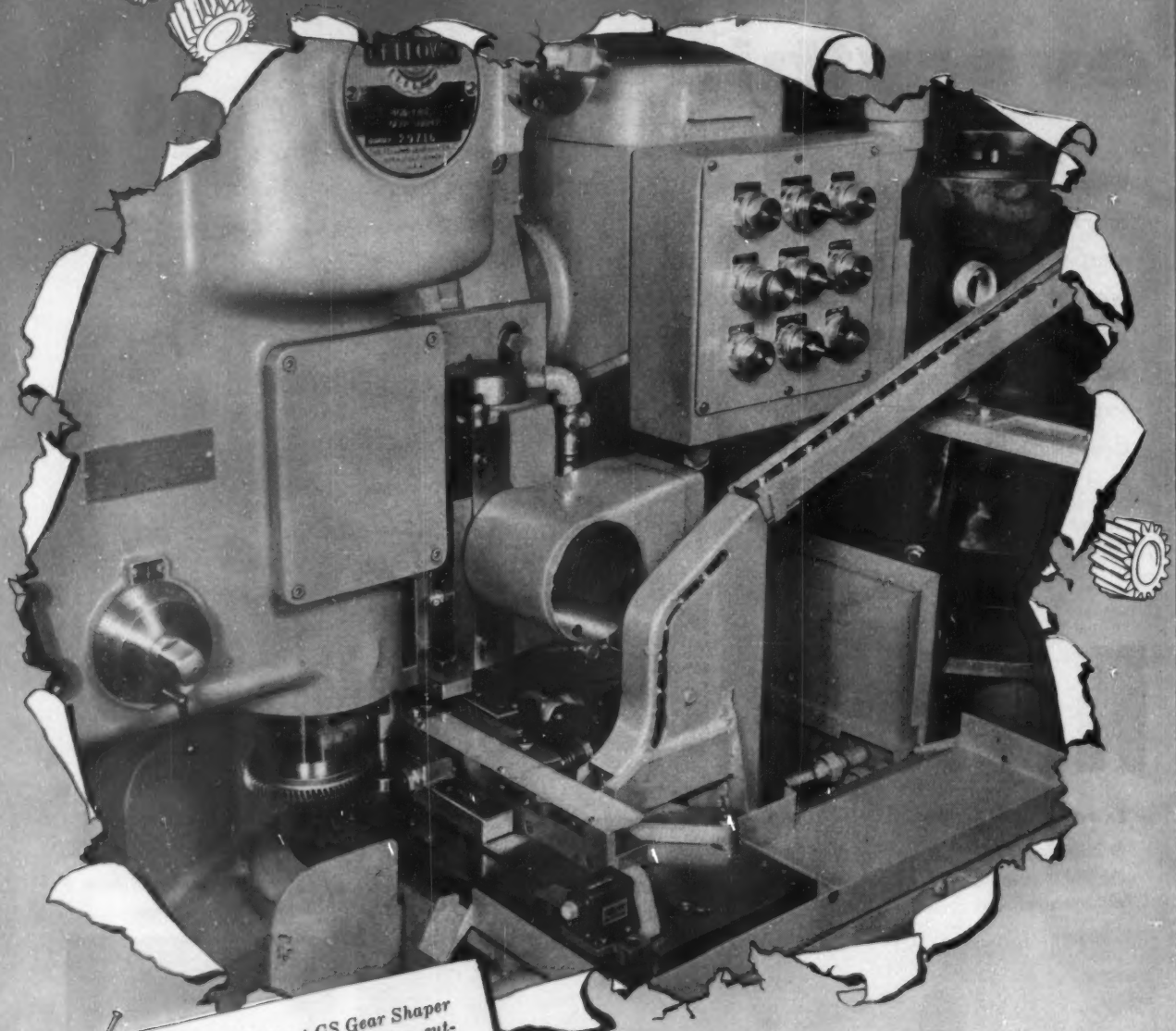
Shaping Attachment

Jobs that would often be assigned to another machine can stay right on the Toolmaster with the ruggedly constructed Shaping Attachment.

Oil-Shot Lubrication

Saddle-table parts and way bearing surfaces are lubricated from a centralized oil-shot system.

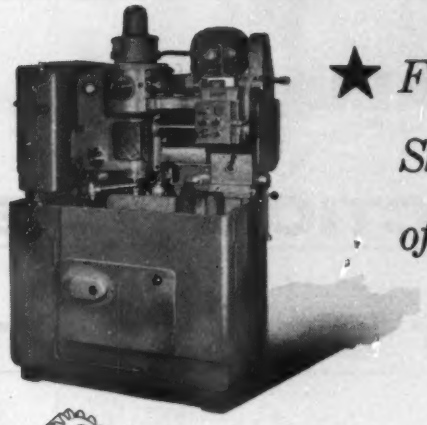
So Fast you may wish



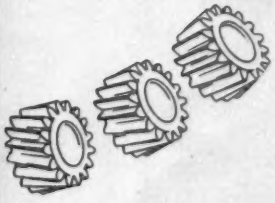
Shown above is the No. 4 GS Gear Shaper equipped for fully automatic loading, cutting and unloading.

THE *Fellows*

to use MAGAZINE FEED!



★ *Fellows New No. 4 GS Gear Shaper ideal for mass output of automotive pinions.*



Rotary feeds of .008" to .024" per stroke of a 4 inch cutter with a husky drive mechanism operating a 3⅜" diameter cutter spindle at speeds ranging from 98 to 635 strokes per minute make the No. 4 GS Gear Shaper a high production machine for gears up to 6" pitch diameter and 2" face width.

To utilize its production speed to the greatest advantage in the smaller size range, the No. 4 GS is designed to facilitate the addition of work magazines or other work loading and unloading devices. Automatic feed production rate for 1-1/16" diameter x ⅝" face width automotive pinions is 1 per minute. Blanks are (1) fed from a feeding device down a chute to the magazine slide, (2) automatically located and clamped on an expanding arbor, (3) cut, (4) automatically lifted off the arbor and (5) ejected into the unloading chute.

It's a production man's machine—standard or automatic. Fellows Sales Engineers will be glad to tell you all about it. Address the nearest Fellows office.

GEAR SHAPER COMPANY

Head Office and Export Dept., 78 River Street, Springfield, Vermont.
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. . . FOR

CLOSE-TOLERANCE GRINDING

of SMALL PARTS at

HIGH PRODUCTION RATES

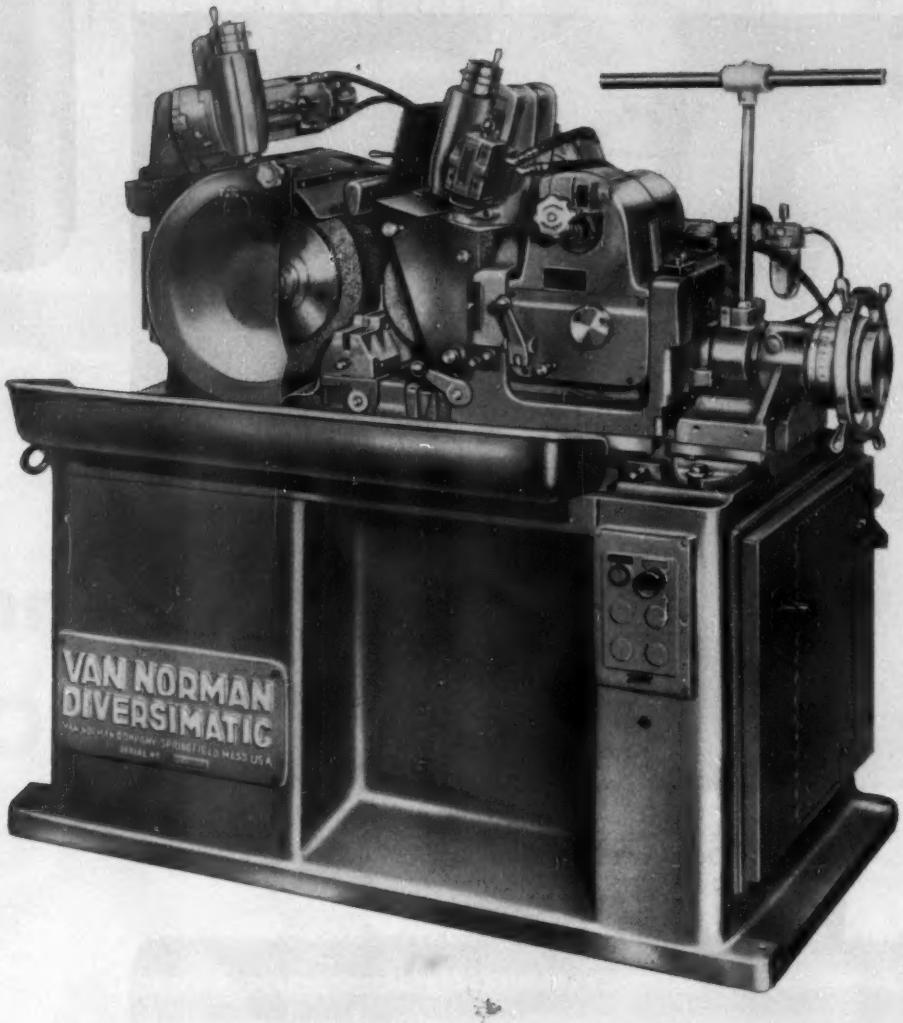
THAT CUT COSTS,

Don't wait . . . for extra profits install a Van Norman machine now! They are available on four purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

VAN NORMAN

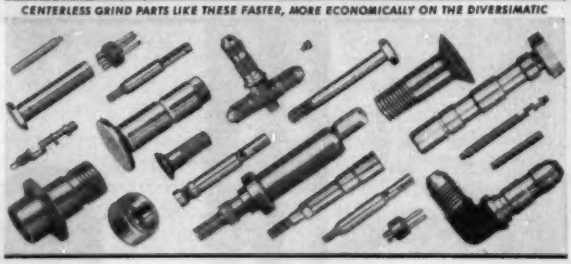
MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



This outstanding centerless grinder can help you cut your grinding costs. It provides fine finish to close tolerances at high production rates. Actually three machines in one, the Diversimatic is a standard centerless grinder for throughfeed work . . . a standard centerless grinder for infeed jobs . . . and equipped with the Crush Forming Attachment, it does form grinding not possible by any other method.

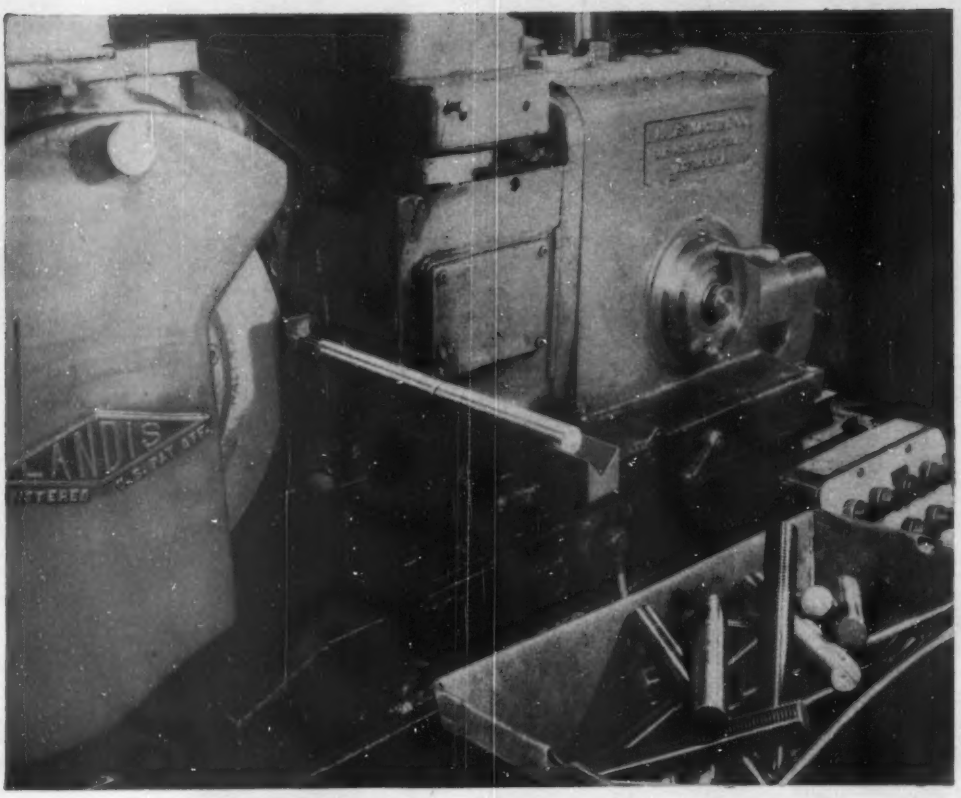
The Diversimatic finish grinds small parts from solid . . . or finish grinds rough-turned parts. It grinds faster, holds tolerances, cuts costs.

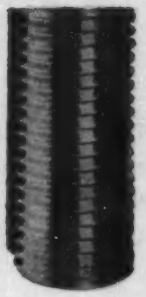
CENTERLESS GRIND PARTS LIKE THESE FASTER, MORE ECONOMICALLY ON THE DIVERSIMATIC

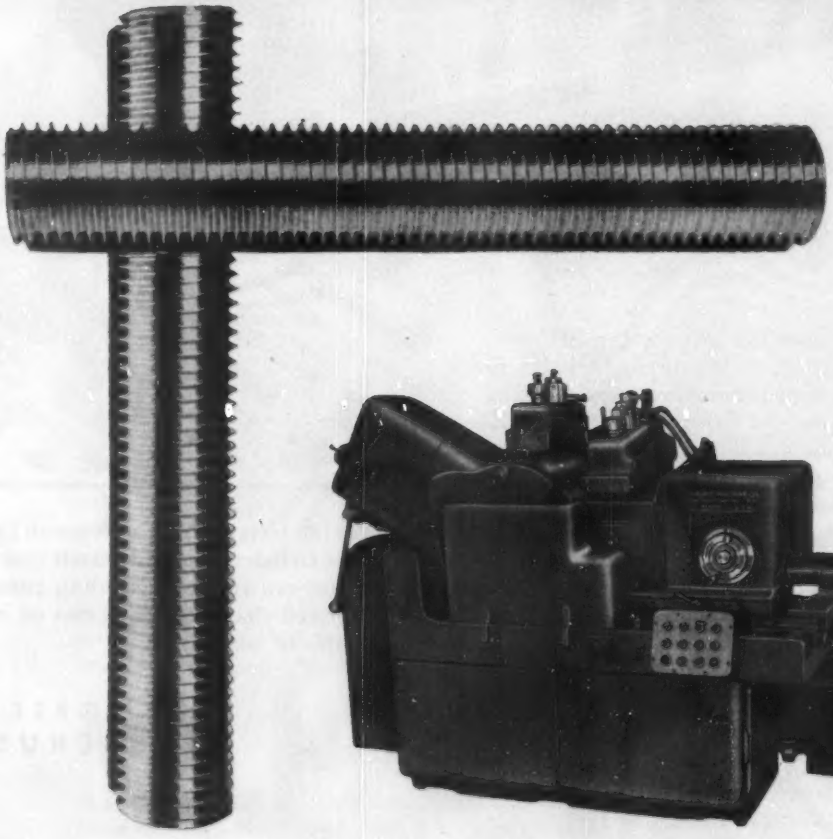


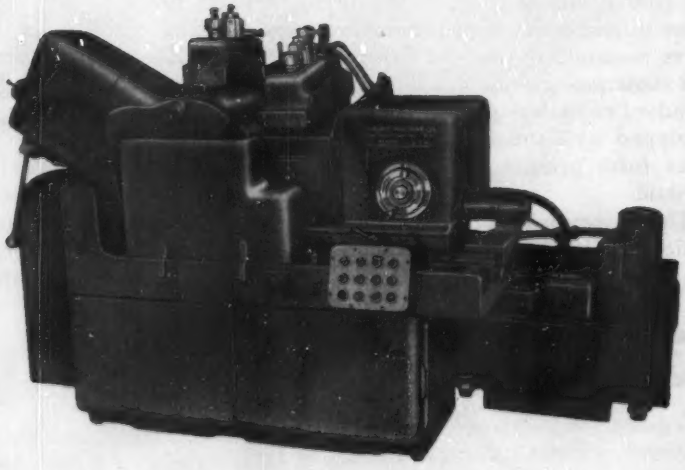
Get the full facts on the Van Norman Diversimatic Centerless Grinder. See for yourself how this versatile grinder can cut your grinding costs on small shafts, formed shapes, parts of two or more diameters or special contours.

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**









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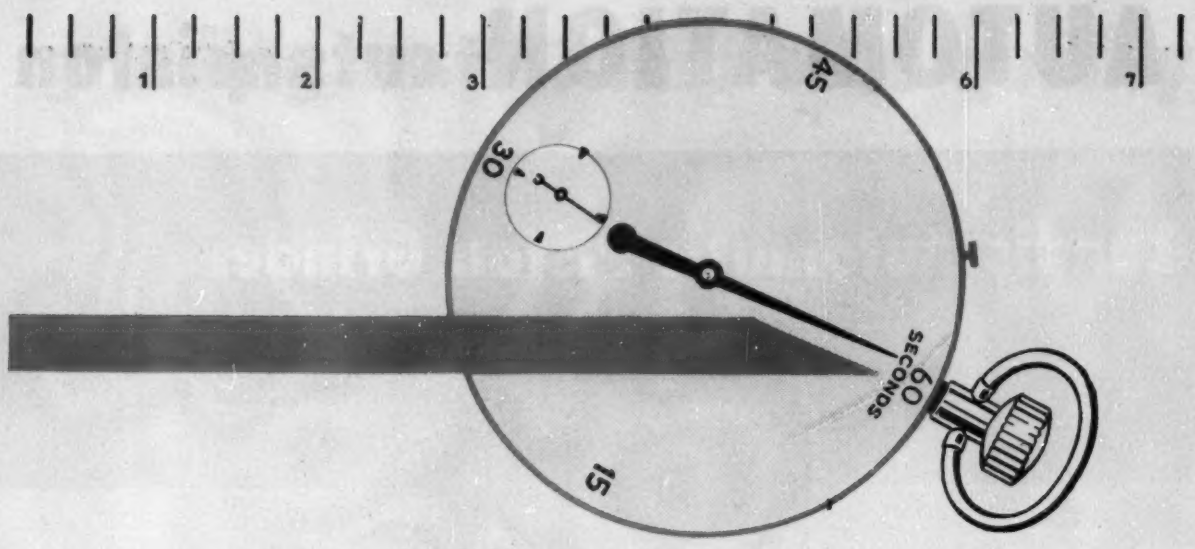


Threads 7¼" per Minute by CONTINUOUS GRINDING

LANDIS Centerless Thread Grinders are being used at the Kilbourn Engineering Company in Milwaukee, Wisconsin, to produce continuous threaded studs for high-pressure high-temperature service.

Studs ranging from ⅝" to 1⅜" in diameter are threaded from blanks of SAE 4140 steel heat-treated to a 260-320 Brinell hardness. In the operations illustrated, 1⅛" 8 pitch UN threads must be generated 10" long to a Class 7 fit to meet ASA standards (Manual B1.4). These threads are produced with LANDIS #1 Centerless Thread Grinders by continuous thru-feed grinding at the rate of 7¼ linear inches per minute, **or better.** The excellent quality and smooth finish of the ground thread has reduced final assembly time and minimized galling.

Centerless Thread Grinders, manufactured exclusively by LANDIS, are designed for the high-speed threading of a wide variety of workpieces from 1/16" to 4¾" in diameter. Blanks having one or more diameters, requiring threads on the outer diameter, can be threaded automatically by the thru-feed process used here.

Centerless Thread Grinding, by utilizing the "up-grinding" technique, is also well-adapted for threading workpieces of high hardness and coarse pitch. This process allows up to 30% higher work surface speeds, and often eliminates secondary threading passes required by other methods. For further information, send specifications and ask for Bulletin E-97.

LANDIS *Machine* CO. WAYNESBORO PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

AUTOMATION cuts piston

Landis Automatic Piston Grinder

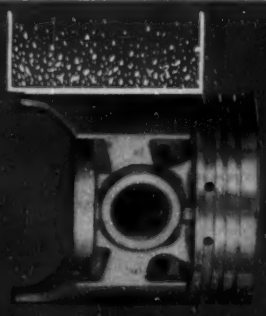
Landis 5" X 8" Type H
Automatic Piston Grinder

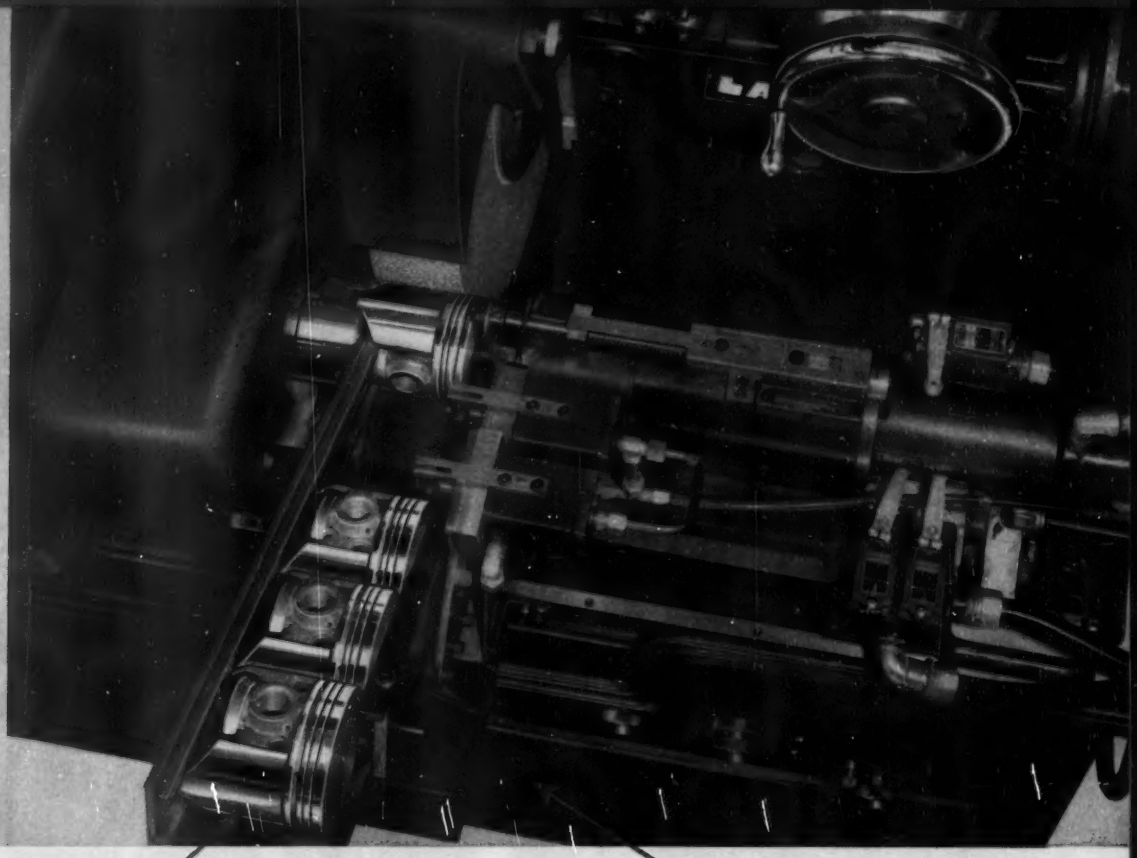
This is another example of the way in which Landis solves grinding problems. Recommendations on how to reduce your grinding costs will be made without obligation.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

grinding costs...improves quality

Grinds cam shaped surfaces of 115 pistons per hour removing .015" stock





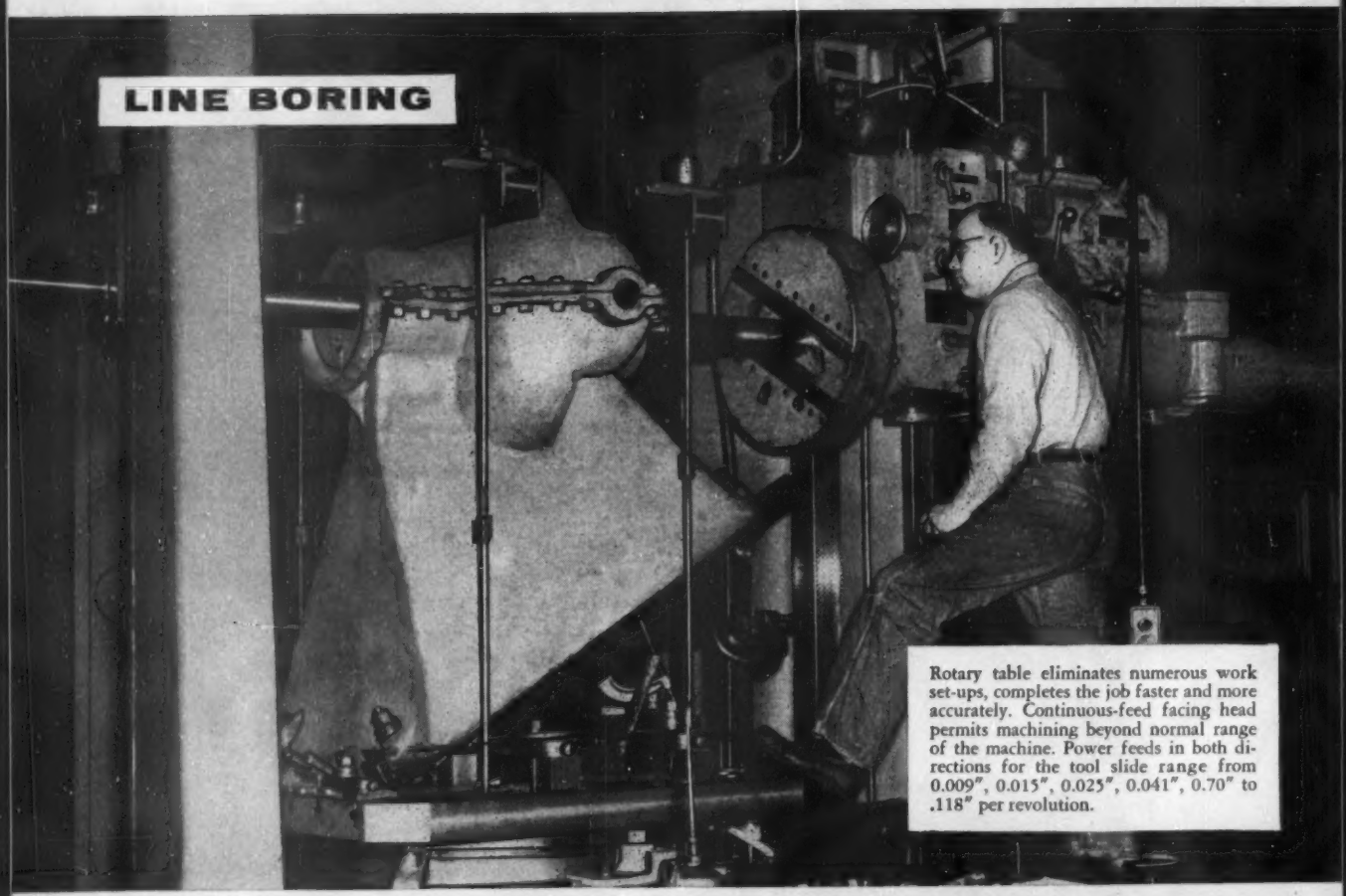
Automatically Loads Pistons from Conveyor

Automatically Ejects Piston to Conveyor

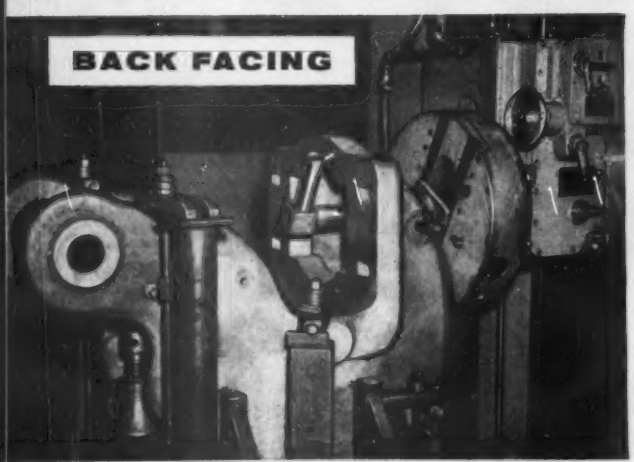
LANDIS

precision grinders

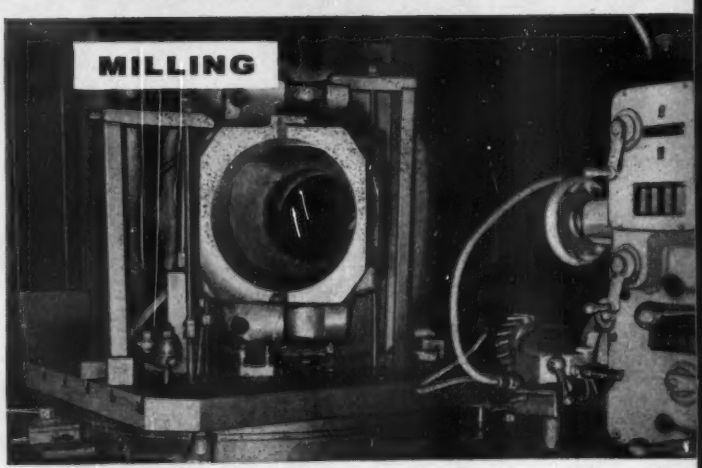
Look at all the operations performs with a



Rotary table eliminates numerous work set-ups, completes the job faster and more accurately. Continuous-feed facing head permits machining beyond normal range of the machine. Power feeds in both directions for the tool slide range from 0.009″, 0.015″, 0.025″, 0.041″, 0.70″ to .118″ per revolution.



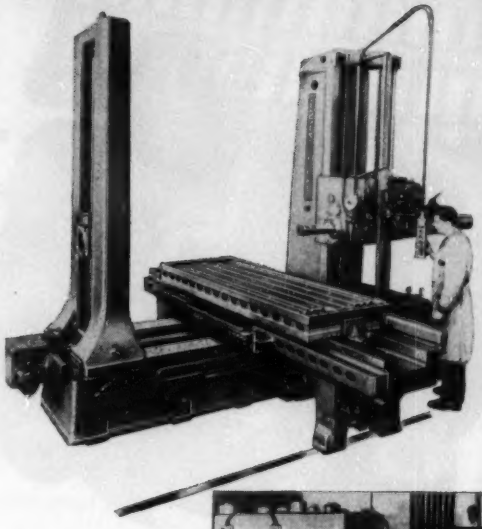
Telescopic tool holder extends through bore in workpiece to hold cutter for back facing operation.



Face milling cutter can be mounted quickly. For angular milling a G&L attachment can be used.

Wilmot Fleming single G&L machine

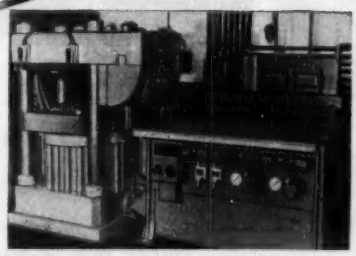
Here's how to tool-up and set-up workpieces to boost production and profits with a Giddings & Lewis 340-T horizontal boring, drilling and milling machine



Most versatile and busiest machine in the shop of Wilmot Fleming Iron & Steel Co., Philadelphia, Pa. — that's the Giddings & Lewis Model 340-T, horizontal boring, drilling and milling machine. Its ability to increase production, save many man-hours and boost profits, permits this manufacturer to perform a considerable amount of subcontract work. This is in addition to production machining of their own product lines.

With G&L's continuous-feed facing head, rotary table and 45 spindle speeds that are easy to select and change, the Model 340-T enables the operator to perform a broad range of machining operations . . . apply heavier cuts and faster cutting speeds.

Compare this 30 Series machine with any other in its class! You'll discover that feature-for-feature — dollar-for-dollar — you can't buy better.



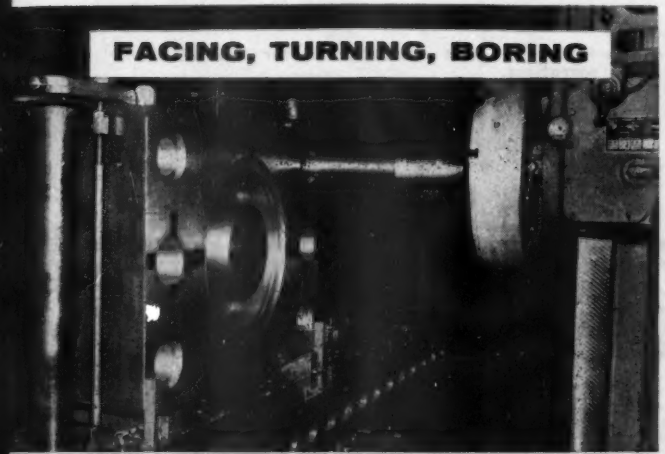
Large and small components of Wilmot Fleming's hydraulic press are precision-machined on G&L's 340-T.

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

GIDDINGS & LEWIS MACHINE TOOL CO.

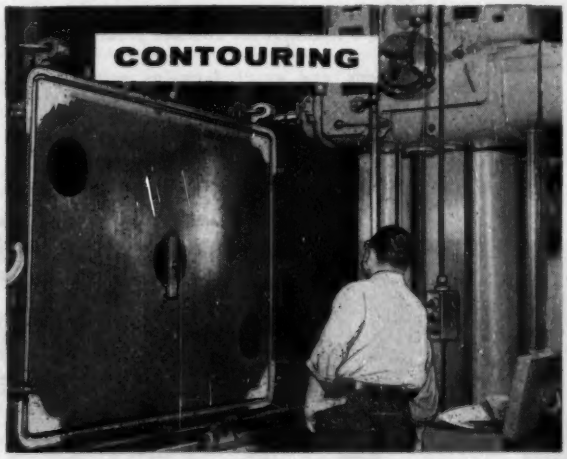
FOND DU LAC, WISCONSIN

FACING, TURNING, BORING



With a continuous-feed facing head, facing, turning and boring operations are performed on one set-up.

CONTOURING



True directional control for contour milling is accomplished manually or through power feed.

THE *Van Keuren* GEAR MEASURING SYSTEM

Set 26EX—Gear Measuring Wires, accurate to ± .000025", for common diametral pitch external spur gears.

VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.

ONLY . . . *EQUIPMENT NEEDED:*

1—SET VK MEASURING WIRES
1—MEASURING INSTRUMENT

Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 35. Included in this section are:

- . . . table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series.
- . . . tables of wire measurement including change factors for standard external and internal spur gears of 14½°, 17½°, 20°, 25°, and 30° pressure angles and of from 5 to 500 teeth.
- . . . table of relationships between depth of cut and tooth thickness for common pressure angle gears.
- . . . definitions and exact formulas covering involute spur gears.
- . . . tables of involute tooth parts for standard addendum and stub tooth involute gears.
- . . . information, formulas and examples regarding the wire measurement of helical gears.
- . . . information and examples concerning the wire measurement of enlarged pinions and reduced gears.
- . . . tables of wire measurement for involute splines.
- . . . tables of wire measurement for involute serrations.
- . . . tables of comparative measurement over three sizes of wires for use in involute profile checking.

CATALOG and HANDBOOK No. 35 is available without charge by writing to: The Van Keuren Co., 173 Waltham St., Watertown, Mass. Ask for your copy.

VK

35th YEAR

THE *Van Keuren* CO.

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

No. 6 in a Series

Carbides dictate the conditions

All accepted cutting tool materials have the common characteristic of specifying the conditions under which they will perform at maximum efficiency. And if the results are sufficiently promising the conditions will eventually be met.

ONE HUNDRED PERCENT carbide application on a multiple spindle bar automatic makes specific demands on both machine and personnel for successful use. The part illustrated is from regular production on comparative runs, in a plant where the conditions were met.

The Conomatic Carbide Development program can be of possible service to you in determining the suitability of your work, or any part of it, to 100% carbide tooling. Just ask your Cone Representative for details, or inquire direct.

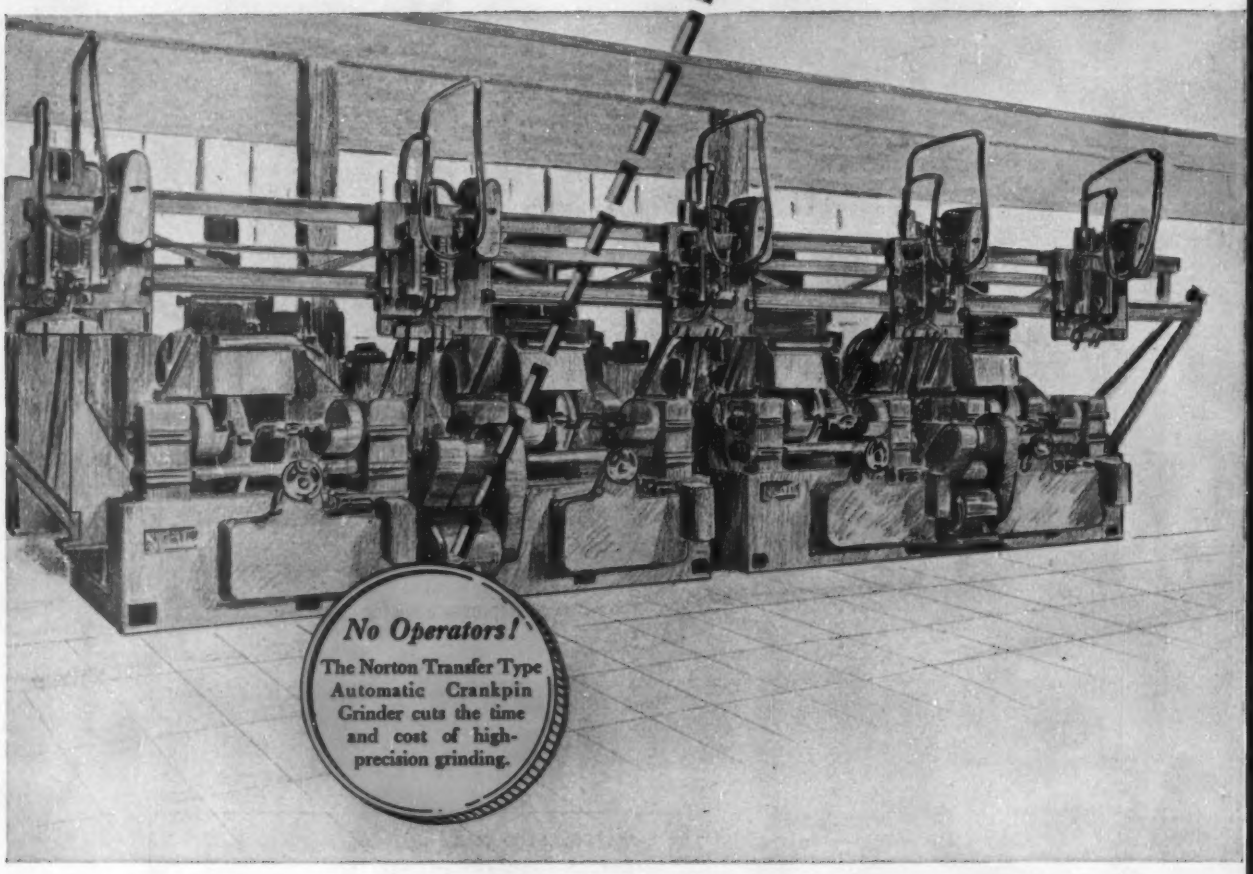
MATERIAL — BRASS: Pickoff attachment in 6th position permits machining piece complete.

	HSS	CARBIDE
Cycle Time	12 secs.	6 secs.
Work Spindle Speed	1125 R.P.M. at 331 S.F.	1528 R.P.M. at 450 S.F.
Tool Wear	50,000 pcs. per grind	unlimited number of pieces per grind

Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Norton Introduces AUTOMATION IN CRANKPIN GRINDING

Cuts Production Costs



All the operators' manual duties now mechanized in crankpin grinding

It was a good question:

Can an operation as intricate and exacting as grinding a crankpin be done by automated machines?

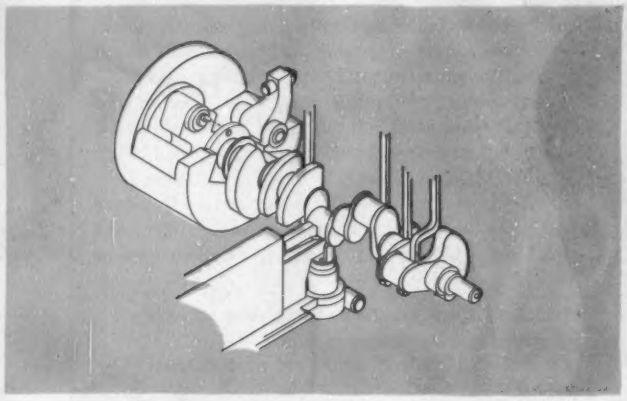
The question is a question no more.

Norton has answered it, "Yes."

Now *all* the manual motions once required of operators are handled automatically. Norton's modern machine for this really tough cylindrical grinding job does all adjusting, controlling, gauging and transferring of the work — plus the rapid, low-cost, high precision grinding required.

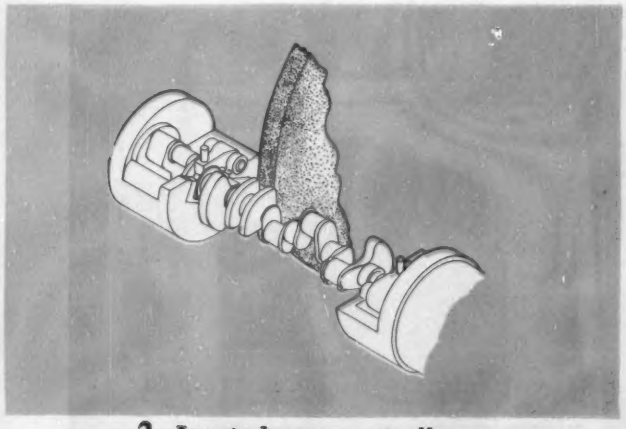
It is another Norton first. Norton is making rapid progress in applying Automation to various types of grinding.

4-way automation in new Norton machine



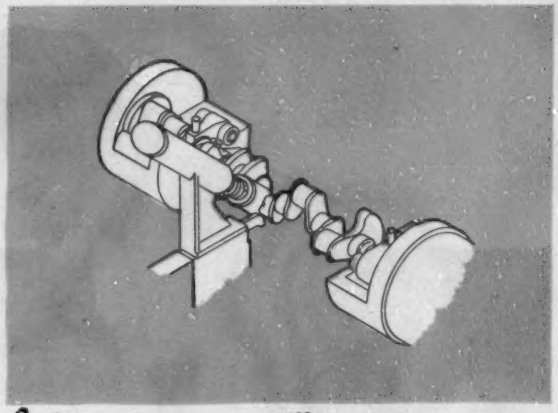
1. It adjusts automatically

Norton Automation locates the work in the grinder both angularly and longitudinally by built-in mechanism . . . grinding wheels are trued automatically . . . automatic compensation for reduction in wheel diameter is made by the feeding mechanism.



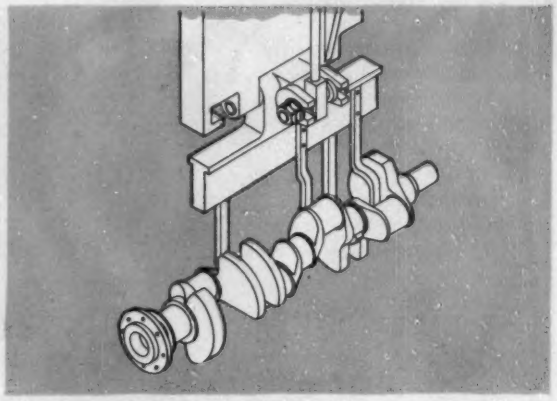
2. It grinds automatically

Being completely automatic, the grinders operate close to 100% efficiency all the working day. They can be pre-set to operate at a definite rate of production continuously. The unit can be controlled, when necessary, to by-pass any inoperative station.



3. It gauges automatically

Spark-out and work size are controlled by an electric gauge which contacts the work during grinding and automatically terminates the cycle by retracting the wheel slide when size is reached.



4. It transfers automatically

Five transfer units travel vertically to pick up and deposit the crankshafts at each station, moving simultaneously. These units are joined together, moving in unison horizontally to transfer the work between stations. The final unit carries ground crankshafts out of transfer machine.

New Automated Grinders Soon to Come . . .

This crankpin grinder is only one of many Norton advances in Automation. For more information about this and other Norton Automated Grinders, write Norton or see your Norton representative. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. For more information, write NORTON COMPANY, Worcester 6, Massachusetts.

To Economize, Modernize with **NEW**

NORTON

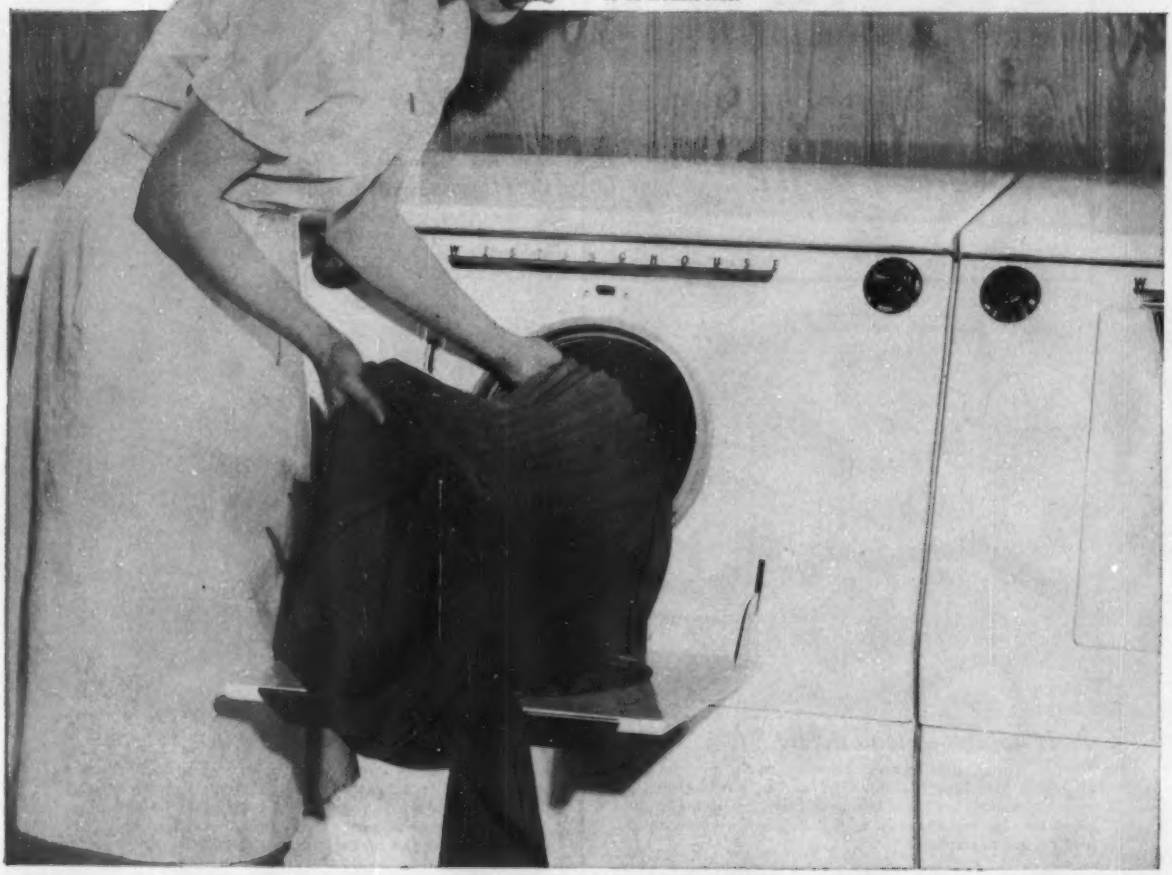
GRINDERS and LAPPERS

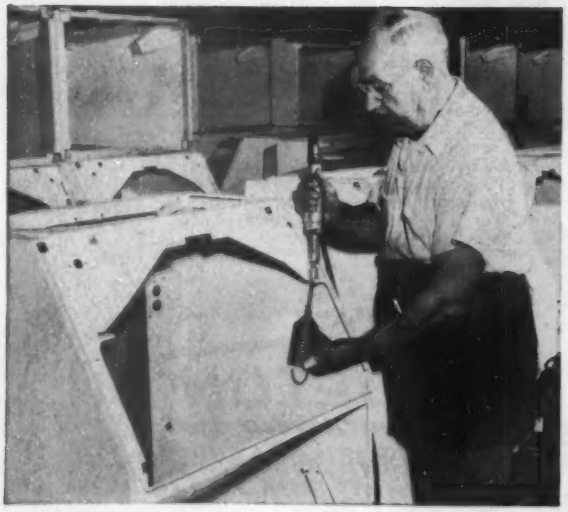
Making better products . . . to make other products better

District Sales Offices: Worcester • Hartford
New York (Teterboro, N. J.) • Cleveland • Chicago • Detroit

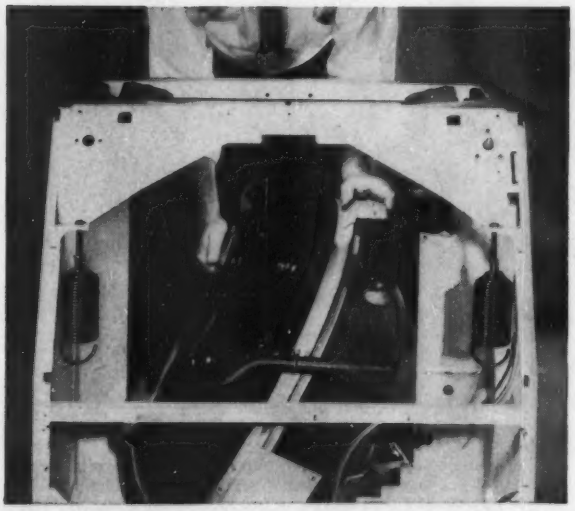
Over 1,000,000

OVER A MILLION families wash their clothes in Laundromats. Westinghouse also does a big export business, so these machines have to be trouble-free.





HERE, a man installs the main suspension springs. The springs are periodically tested to meet severe 450 c.p.m./$\frac{1}{4}$-inch amplitude, vibration tests.



AS UNIT IS INSTALLED in shell, man holds top damper spring. Notice damping blocks on end of flat spring to reduce excess movement.

Laundromats in use, but...

"We've never had a failure with American Quality Springs"

says *WESTINGHOUSE ELECTRIC CORPORATION*

THE Westinghouse Laundromat has been a household word ever since the first unit rolled off the production line in 1940. Since then, Westinghouse has produced over 1,125,000 Laundromats. Despite many important improvements, the superb spring suspension system has stood the test of time. It's the same today as it was in 1940, because it was designed so well in the first place.

Three different styles of American Quality Springs are used in the Laundromat. The *coil* springs support the entire weight of the machine within its shell. The *flat* steel springs contain friction dampers that limit excessive movement caused by an unbalanced load during the spin-dry cycle.

Failure of a coil spring could damage the entire machine. At the least, it would mean an expensive service call. But, because of the efficient design, and the completely reliable American Quality Springs, *no spring has ever failed in a Westinghouse Laundromat.*

If service like this makes sense to you, get in touch with your nearest American Steel & Wire representative. We make all kinds of springs, any steel, any finish. And you'll get the same kind of quality that Westinghouse gets.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

U·S·S American Quality Springs

UNITED STATES STEEL

BOTTOM DAMPER springs are installed. Because of the entire engineered suspension, Laundromat was one of the first washers that didn't have to be bolted to floor.

WESTINGHOUSE LAYS DOWN rigid specifications for their American Quality Springs, proving their motto, "Quality must be *built* into a product."

RAM TYPE TURRET LATHES

NO. 2 ALL GEARED HEAD
1" Bar Capacity
14" Swing

NO. 3 UNIVERSAL
1½" Bar Capacity
15⅜" Swing

NO. 4 UNIVERSAL
2" Bar Capacity
18⅛" Swing

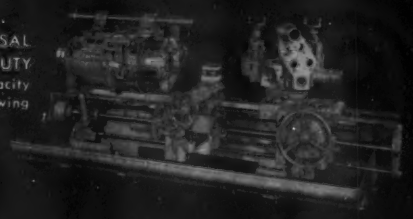
NO. 5 UNIVERSAL
2½" Bar Capacity
20" Swing

SADDLE TYPE TURRET LATHES

1-A UNIVERSAL
HEAVY DUTY
2½" or 3" Bar Capacity
16¼" Swing

2-A UNIVERSAL
HEAVY DUTY
3½" Bar Capacity
20" Swing

3-A UNIVERSAL
HEAVY DUTY
4½" or 6" Bar Capacity
23½" Swing



4-A UNIVERSAL
HEAVY DUTY
8" 9" or 12" Bar Capacity
28¼" Swing

PRECISION TAPPING AND THREADING MACHINES

NO. 10
TAPPING MACHINE
0-80 to 10-24 Capacity

NO. 11
TAPPING MACHINE
8-36 to ⅞" Capacity

NO. 11 RS RADIAL (Single Head)
NO. 11 RD RADIAL (Double Head)
8-36 to ⅞" Capacity

NO. 12
TAPPING MACHINE
¼" to 2½" Capacity

MULTI-SPINDLE AUTOMATICS

6-SPINDLE BAR MACHINE
¾" or 1¼" Bar Capacity

5-SPINDLE
CHUCKING MACHINE
6" Swing

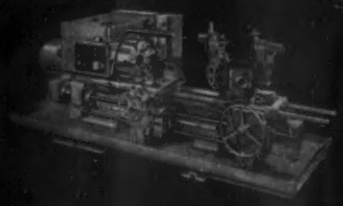
5-SPINDLE BAR MACHINE
1⅜" Standard Bar Capacity
2¼" Oversize Capacity

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

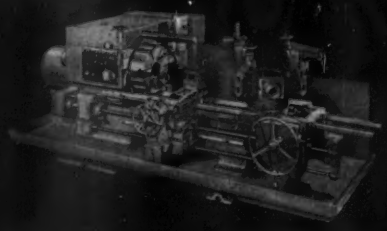
SADDLE TYPE TURRET LATHES

1-A UNIVERSAL
EXTRA-HEAVY DUTY
2½" or 3" Bar Capacity
16¼" Swing

2-A UNIVERSAL
EXTRA-HEAVY DUTY
3½" or 4½" Bar Capacity
20" Swing



3-A UNIVERSAL
EXTRA-HEAVY DUTY
4½" or 6" Bar Capacity
23½" Swing

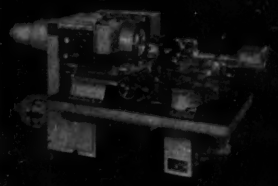


4-A UNIVERSAL
EXTRA-HEAVY DUTY
9" or 12" Bar Capacity
28¼" Swing

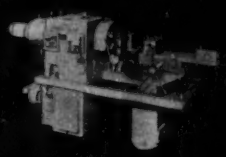
ELECTRO-CYCLES

NO. 1 ELECTRO-CYCLE
⅝" Bar Capacity
11" Swing

NO. 2 ELECTRO-CYCLE
1" Bar Capacity
14" Swing



NO. 3 ELECTRO-CYCLE
1½" Bar Capacity
15⅜" Swing



16" ELECTRO-CYCLE
1½" Bar Capacity
16⅞" Swing

SINGLE SPINDLE AUTOMATICS

1 AC CHUCKING MACHINE
8" or 10" Chuck — 6" Working Stroke

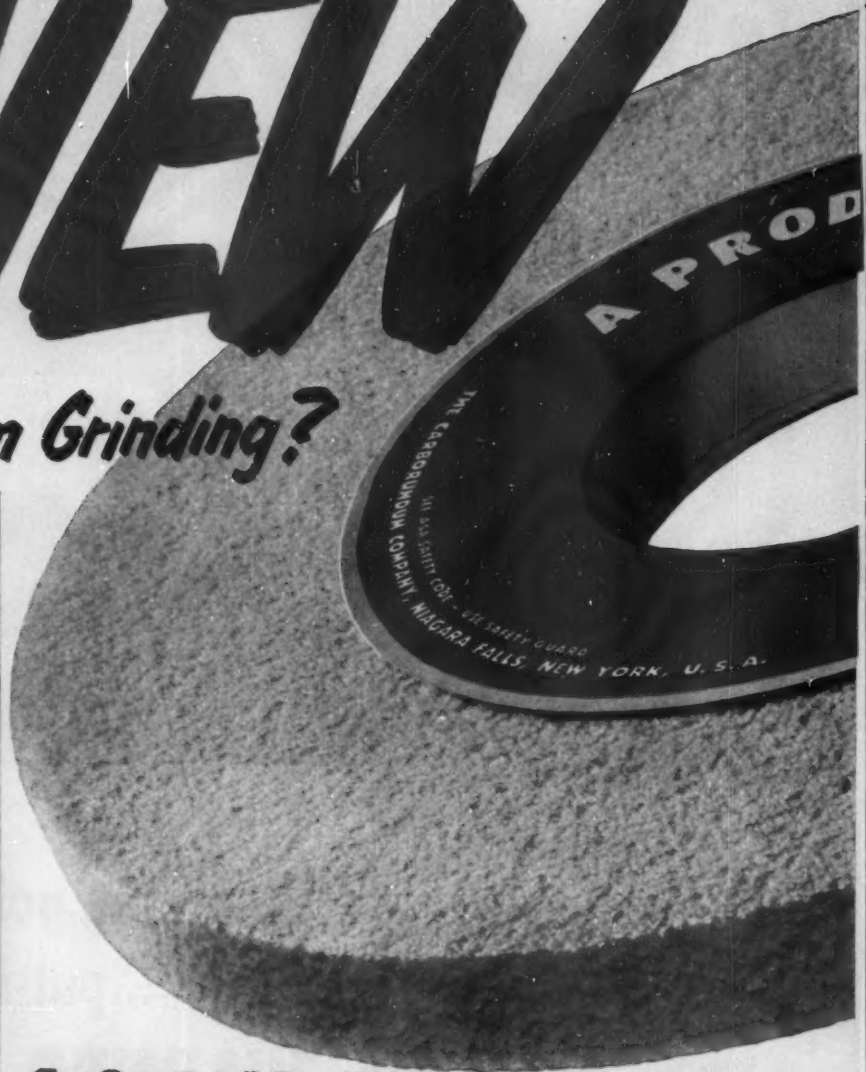
2 AC CHUCKING MACHINE
10" or 12" Chuck — 9" Working Stroke

When the going gets tough ...put it on a WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

WHAT'S NEW in Tool Room Grinding?

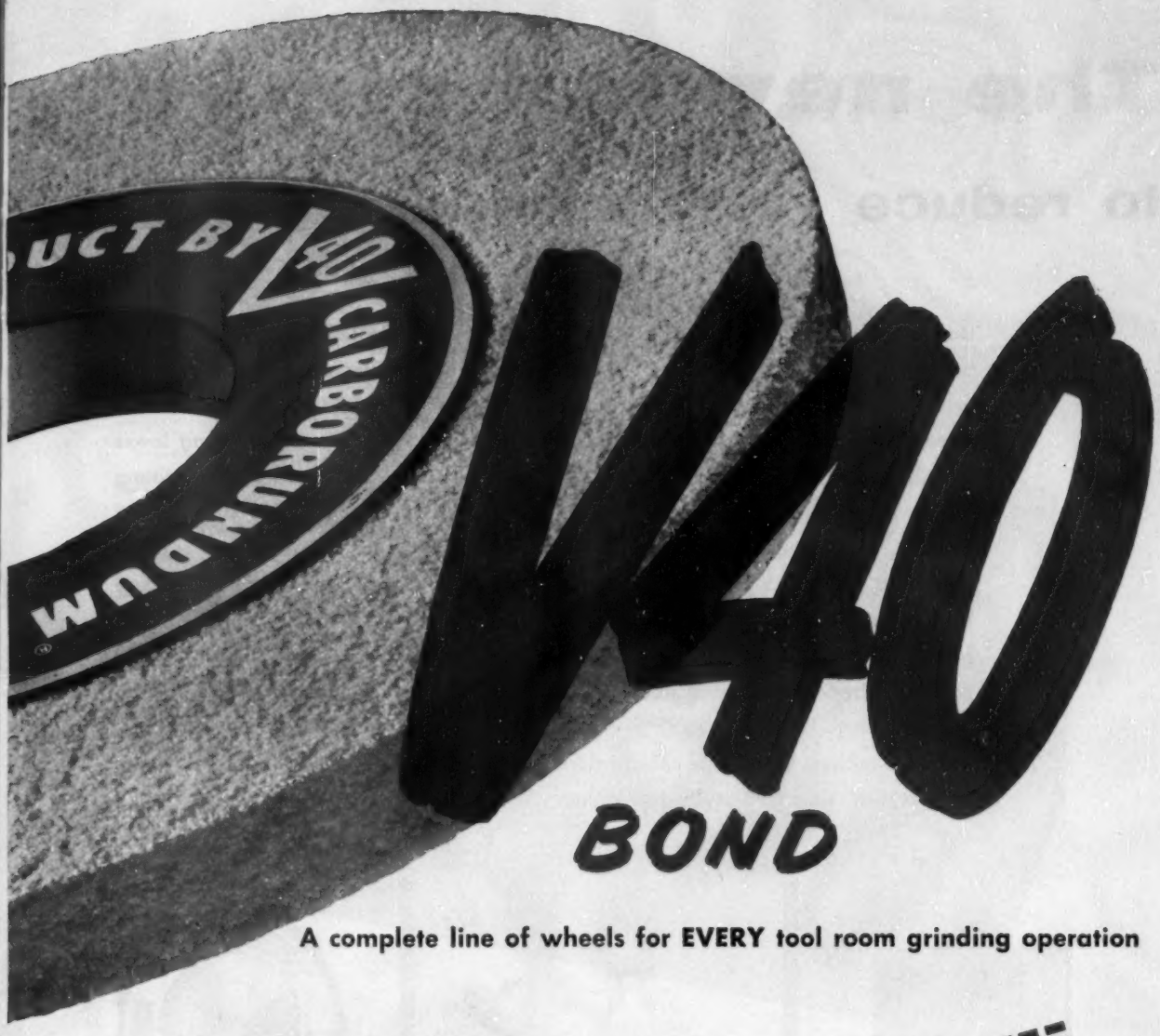


SUPERIOR PERFORMANCE

COMPLETE STOCKS—Immediate delivery from your CARBORUNDUM Distributor!

Call him, or your CARBORUNDUM Salesman (listed in the yellow pages under "Abrasives" or "Grinding Wheels") for full details on these outstanding V40 Bond Wheels and a demonstration in your own shop, on your own tools. Or write to the Carborundum Company, Dept. AM, 81-414, Niagara Falls, New York.

...continually putting more sense in your abrasive dollar



A complete line of wheels for EVERY tool room grinding operation

...IN EVERY WAY

- **Cool and Free Cutting,** on high speed steels, even on hi-vanadium types.
- **Greater Form-holding Ability,** for longer wheel life, less edge breakdown, less dressing.
- **Easier Dressing,** because of special V40 bond composition, gives substantial savings in diamonds, time and abrasive.

EASY TO ORDER

You can usually order V40 Bond wheels in the same grit and grade as you are now using. (Specify AA Type abrasive in V40 Bond). But—that's where the similarity ends. For V40 Bond Wheels will outlast, outperform any other tool room wheel in your shop.

CARBORUNDUM

REGISTERED TRADE MARK

81-41F

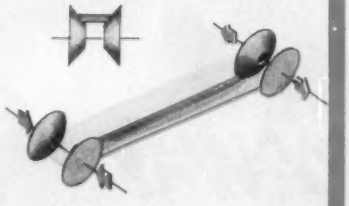
The new Cincinnati

to reduce your centerless grinding

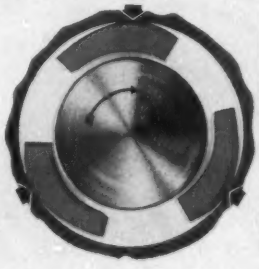
During the past 33 years, Cincinnati has been building the world's finest line of centerless grinders; analyzing centerless requirements for customers; tooling up the machines for low-cost production. All these years of experience in centerless design and application has gone into the new No. 2. You will find it more accurate, more versatile than ever before. Time-proved Cincinnati advantages have been retained . . bed-rock grinding wheel spindle mounting; FILMATIC grinding wheel spindle bearings; lower slide construction for workrest; simplified method of truing regulating wheel. And now these additional advantages are included . . infinitely variable regulating wheel speeds; pre-loaded, precision ball bearing lower slide; pressure lubrication of regulating wheel spindle bearings; stabilized infeed screw. ¶ Of course, many more features desired by centerless grinder users are incorporated in the new CINCINNATI FILMATIC No. 2 Centerless Grinder. Would you like to know more about them? Write for new catalog No. G-644.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

Infeed handwheel is located at the front of the machine, convenient for operator; graduated in increments of .0001".



Smooth regulating wheel drive through variable pitch sheaves; infinite number of speeds, handwheel selected and tachometer indicated.



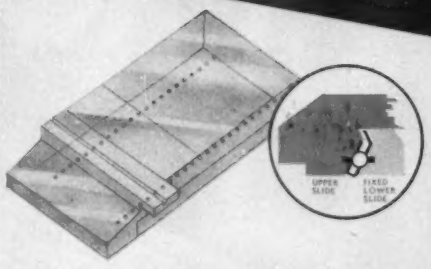
FILMATIC grinding wheel spindle bearings are still the best in the machine tool industry; no fuss, no bother.

CINCINNATI

has what it takes

costs

New CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Write for complete details. Catalog No. G-644.



Precision anti-friction slide under regulating wheel unit; split-hair dial adjustment is translated precisely to infeed movement.

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

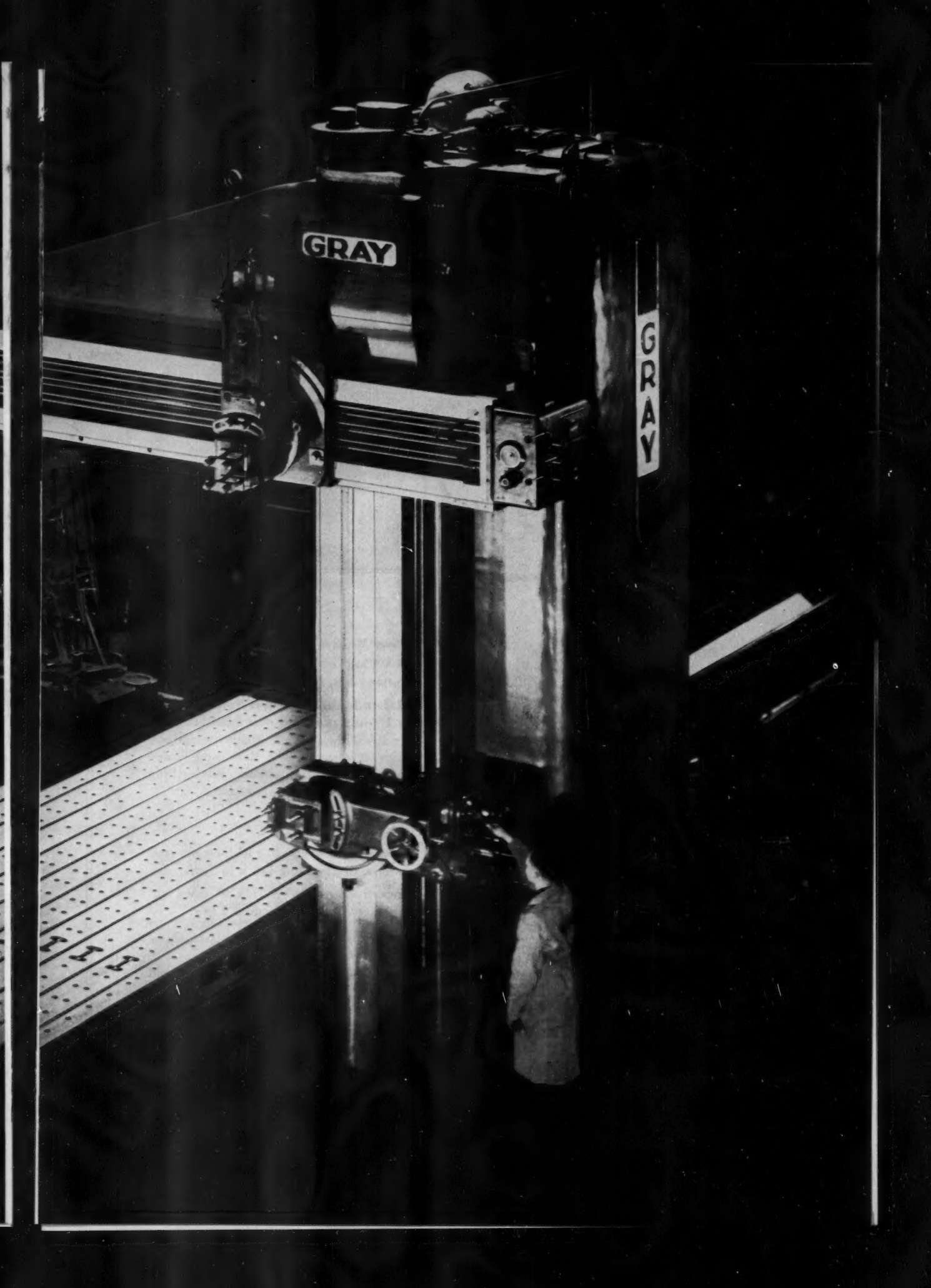
King - size

Here is one of the year's largest planers, a GRAY, immense in size, yet so superbly engineered and magnificently built that its precision performance is a marvel to behold.

All GRAY planers from king-size Giants to eager Cubs are built for high production. They have more original engineering developments and production features than any other planer. They are in such demand that GRAY is the largest planer builder, further proof that

Quality doesn't cost . . . it pays.

The G. A. GRAY Co., Cincinnati, Ohio.


GRAY
GRAY

Here's why users are re-ordering Norton discs

Job reports show how disc grinding can be made more profitable with the money-saving "TOUCH of GOLD"

Typical reports from customers who re-ordered Norton discs

From Tennessee

Job: Wet grinding ends of universal joint spiders, case hardened steel, 58 to 62 R.C., ½" diameter. Rotary work carrier.

Report: Pair of Norton 22" x 2" x 14" discs produced 366,975 pieces without burn — outlasted and outperformed all other discs.

From Indiana

Job: Double disc dry grinding, 6" to 8" diameter cast iron rings, ¾" face, removing .015", .010" and .005" in 3 successive passes.

Report: Norton 30" x 2" x 3½" discs averaged 21,500 pieces, a new high for this job.

From Illinois

Job: Double disc wet grinding hot wound heavy duty coil springs. Reciprocating work holder.

Report: Norton 30" x 3" x 6" discs rated high above competition for output and grinding quality.

From Missouri

Job: Double disc wet grinding cast iron piston rings, roughing operation.

Report: Initial shipment of Norton 30" x 1" x 1" discs produced over 6,000,000 rings — 100% more than competitive discs, with 50% less dressing. Results duplicated in subsequent shipments, establishing Norton discs as best ever received.

From Kentucky

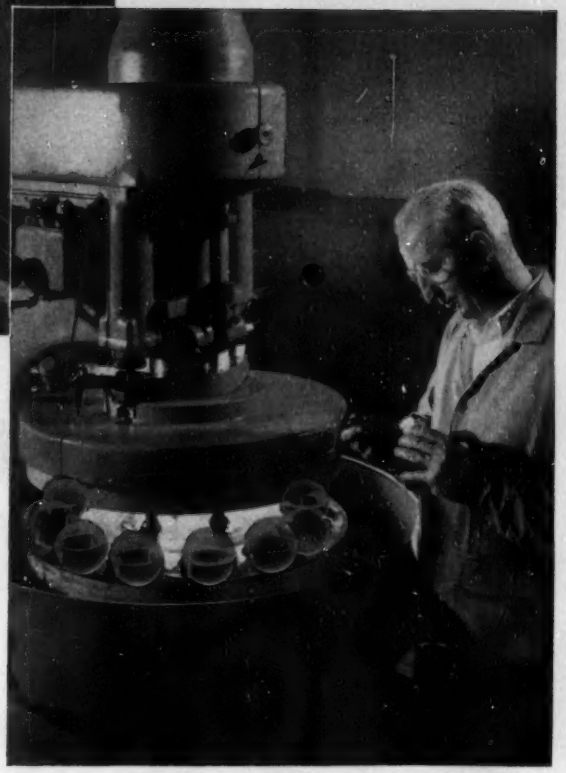
Job: Single disc grinding high-carbon steel inserts, dry grinding ½" x ¼" area.

Report: Norton 18" x 2" x 5" discs outproduced best previous discs 2 to 1.

From Michigan

Job: Tool room surfacing steel jigs and fixtures, single disc, wet grinding small to large areas, up to .125" stock removal.

Report: Norton 18" x 4" x 14" discs gave 20% longer service life than competitive discs.



Once Norton discs are tried, you can give odds that they'll be re-ordered. Freer, cooler cutting action, longer service life and increased production per disc are very good reasons why. Let's look at some other reasons:

- Norton discs are engineered to give best results over the entire range of disc grinding — from snagging to lapping, single or double surfacing, wet or dry grinding, large or small areas — on every type of disc grinder.
- They are made of the famous ALUNDUM* and CRYSTOLON* abrasives, in five bonds and all types of mountings.
- Their wide variety covers all materials ground by this method — metallic or non-metallic, ferrous or non-ferrous, alloys or machine steels, hard or soft.
- They are precision-built for uniform grinding action throughout their service life — from disc to disc and lot to lot.

Norton will engineer discs to your exact specifications — and duplicate these exactly on each re-order. It's the simple, logical way to put the profit-boosting "Touch of Gold" into your own disc grinding operations.

Your Norton Distributor

can give you valuable help in selecting the right discs for your jobs. Ask him for the new booklet "Disc Grinding." Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1587

Making better products . . .
to make other products better

NORTON

and its BEHR-MANNING division

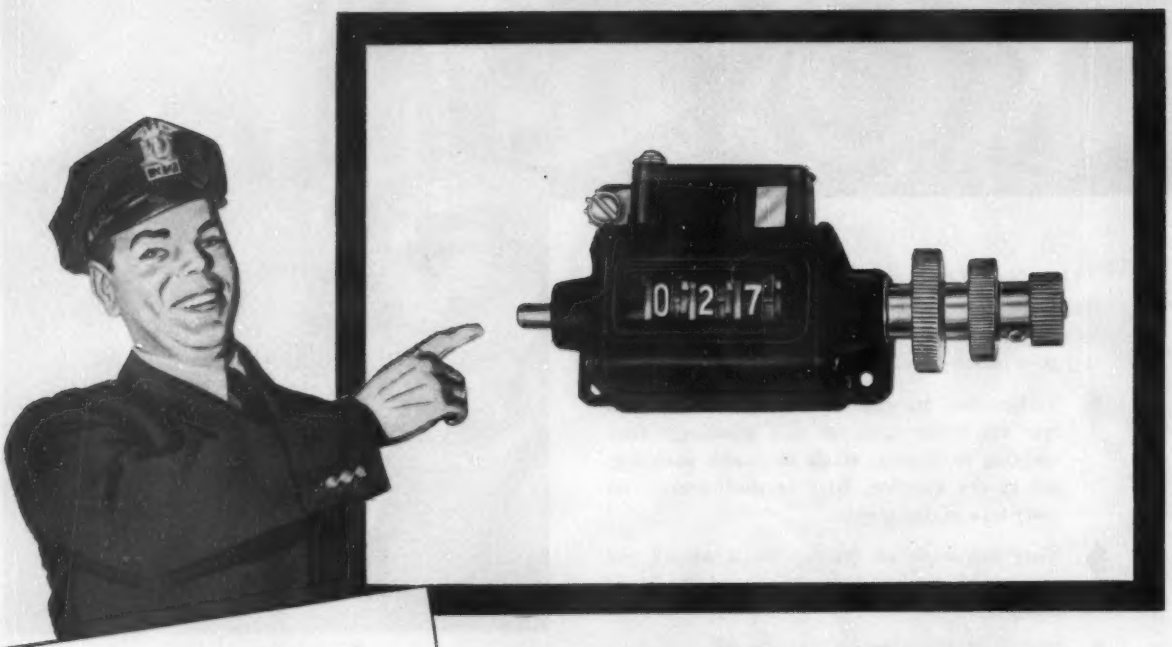
NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Here's a New

"TRAFFIC COP"

for short high-speed runs



Added Evidence that—

Everyone Can Count on VEEDER-ROOT

This new small Predetermining Ratchet Counter is set for any run up to 1,000 counts, pieces or other units by the three knurled setting knobs. Then it subtracts to zero, and at that point actuates a contact to light a light, ring a bell or stop the machine. Compact and easy to reset, this counter makes an attractive new selling feature when built into a machine as a standard integral part. And it's just one of scores of standard and special Veeder-Root Counters for every mechanical and electrical application in any field from atomics to automation. What would *you* like to count? Let Veeder-Root figure out how to do it. Write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
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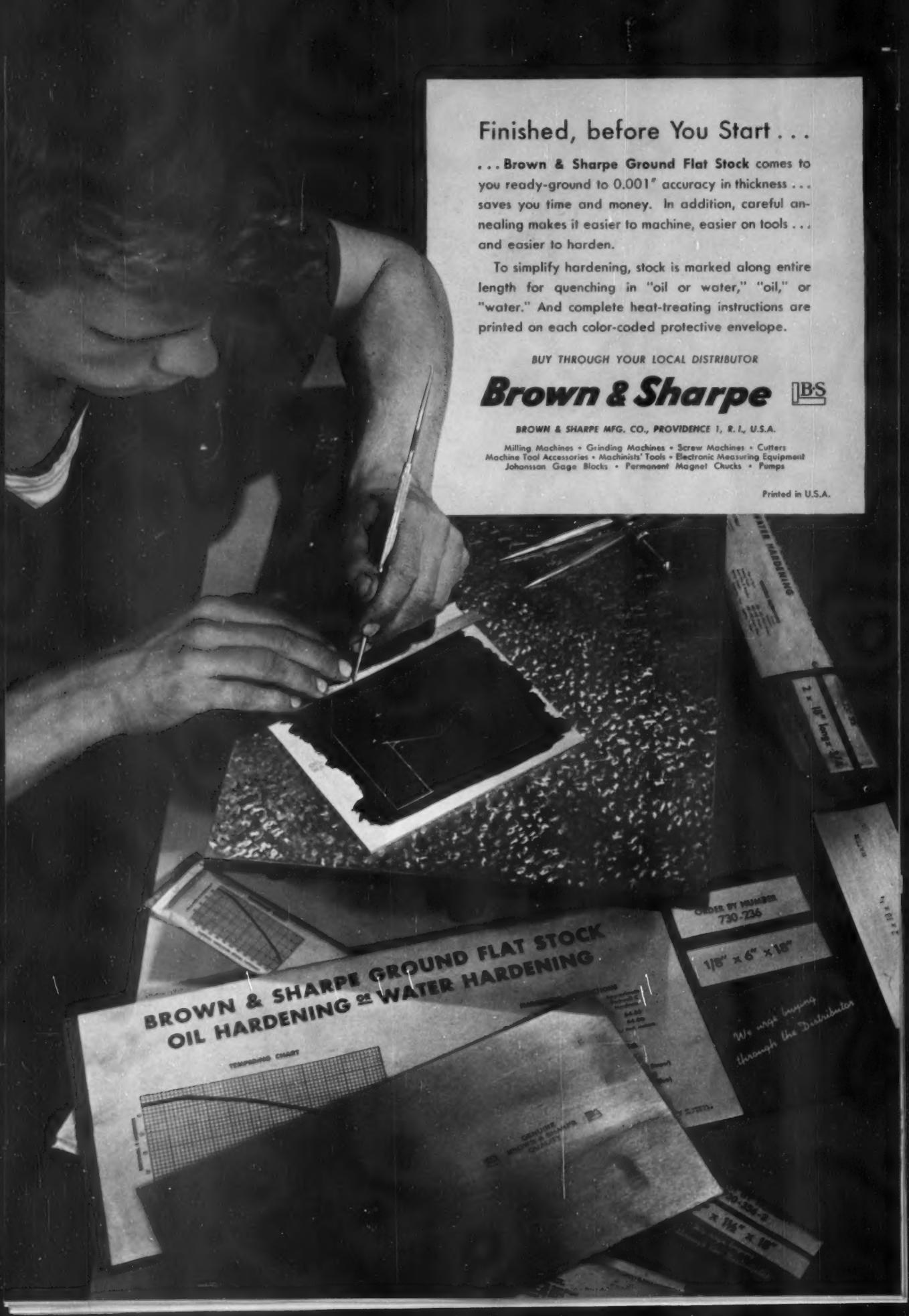
® **"The Name that Counts"**

Hold Everything . . . At the Turn of a Lever!
Brown & Sharpe Permanent Magnet Chucks give you faster, dependable chucking for a wide variety of jobs. Their powerful magnetic grip engages or disengages at the turn of a lever. Strong permanent magnets make holding ability completely reliable . . . immune to plant power failures. And, freedom from electric wires permits using these chucks anywhere in the shop. Rectangular Models in 8 sizes from 2½"x5" to 12"x36"; Rotary Models in 5", 7" and 9" diameters. Write for catalog containing specifications on the complete line.
Brown & Sharpe


BROWN & SHARPE GROUND FLAT STOCK
OIL HARDENING or WATER HARDENING
TEMPERING CHART
ORDER BY NUMBER
730-236
1/8" x 6" x 18"
We urge buying through the Distributor

Finished, before You Start . . .

. . . **Brown & Sharpe Ground Flat Stock** comes to you ready-ground to 0.001" accuracy in thickness . . . saves you time and money. In addition, careful annealing makes it easier to machine, easier on tools . . . and easier to harden.

To simplify hardening, stock is marked along entire length for quenching in "oil or water," "oil," or "water." And complete heat-treating instructions are printed on each color-coded protective envelope.

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Milling Machines • Grinding Machines • Screw Machines • Cutters
Machine Tool Accessories • Machinists' Tools • Electronic Measuring Equipment
Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

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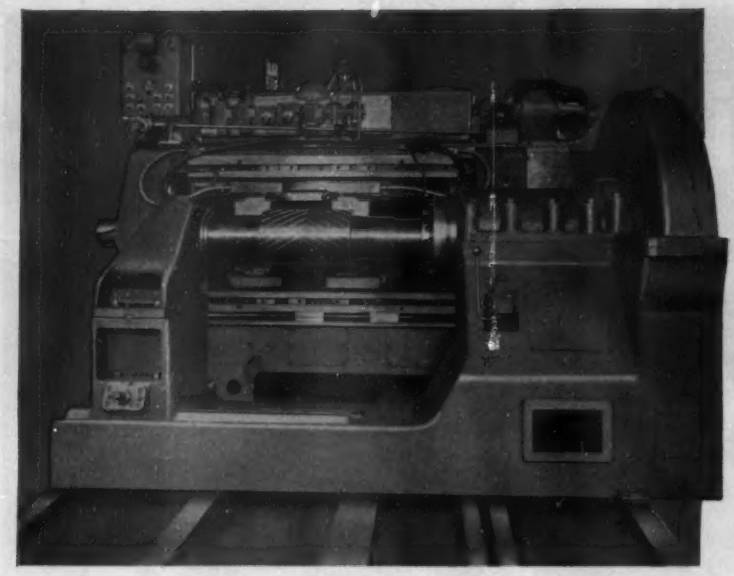
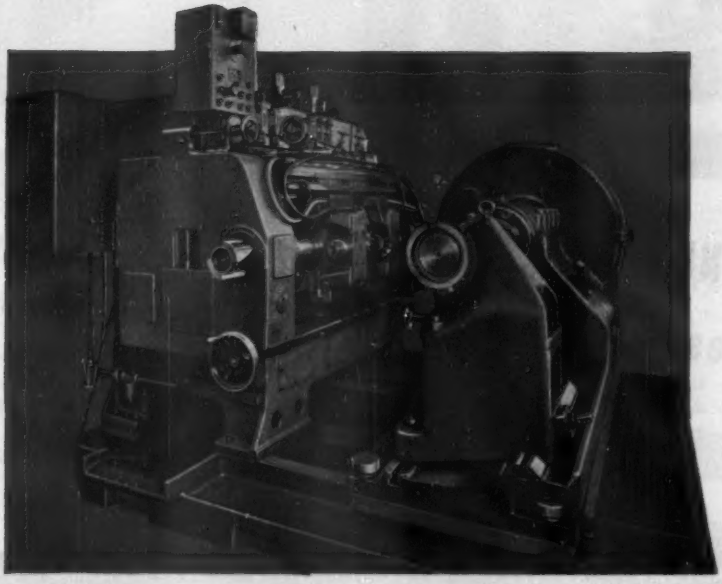


This front view shows start of cutting operation on continuous tooth herringbone pinion with integral shaft. Controls are at upper left within easy reach of operating position.

The new Farrel-Sykes gear machine, the "Twin-Head" generator, cuts gears as much as 33⅓% faster than preceding models, with higher accuracy and finish. This increased speed means fewer man and machine hours, with a resultant substantial decrease in manufacturing costs.

Setup time has also been reduced, and this, together with other conveniences afforded by new design features, contributes to more efficient operation. Rapid selection of speeds and feeds, easy adjustment of

How you can cut your gear manufacturing costs!



Side view, showing the twin cutting heads, left-hand helical guide, operating controls and work saddle.

cutters, easy and positive control of infeed, or depth of cut, are a few examples. On smaller gears the operator has merely to place the blank in position, press the starting button, and remove the gear after the teeth are cut.

Besides these advantages, the "Twin-Head" generator has exceptional versatility. It will cut all types of herringbone gears, single helical and spur gears, two members of a cluster gear simultaneously, and other toothed and cylindrical forms.

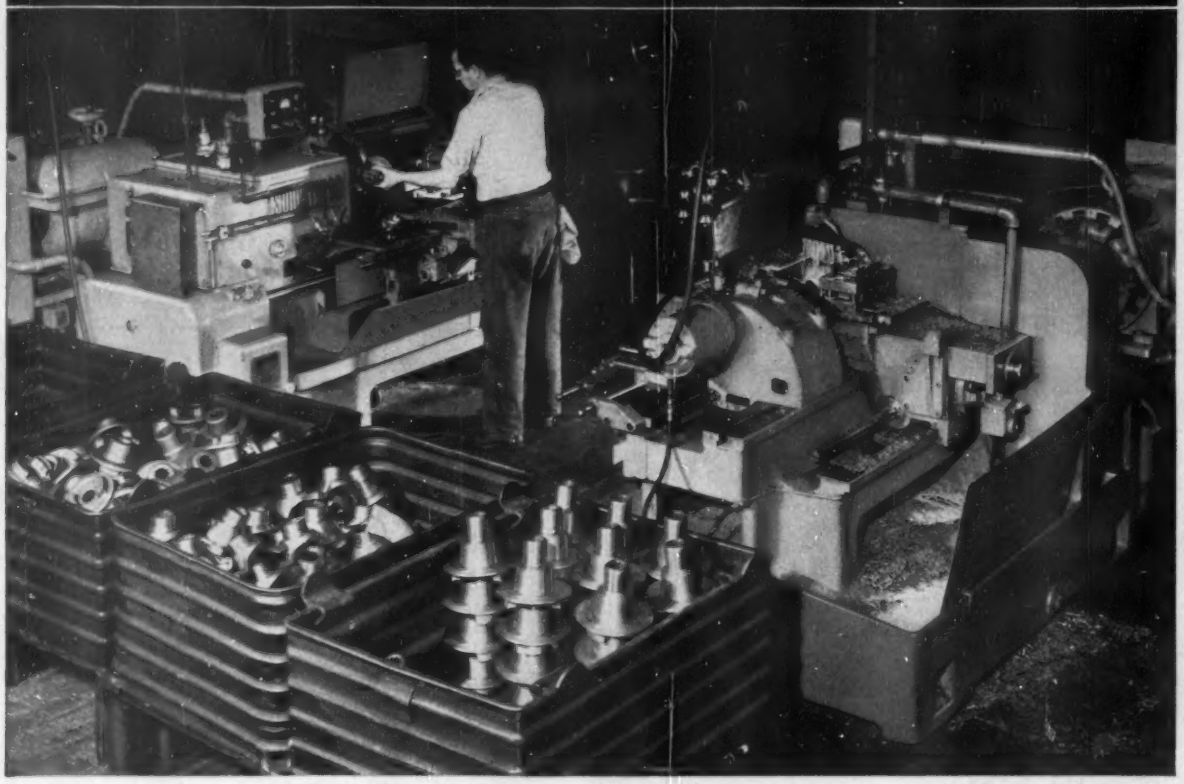
Write today for details of this new gear machine.

FARREL-BIRMINGHAM COMPANY, INC.,
ANSONIA, CONN.
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Cambridge (Mass.), Akron, Cleveland, Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB-900

Production Increased

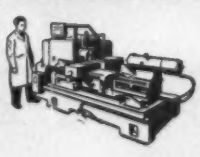


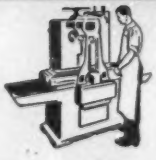
...with SUNDSTRAND Automatic Lathes

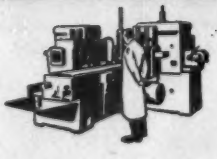
Two Sundstrand Model 8A Automatic Lathes are used for turning fitting yokes, slip yokes and weld yoke parts for the Mechanics Universal Joint Division, Borg-Warner Corp. of Rockford, Illinois. Use of these two Sundstrands has increased production over five times compared to former method. In addition to the production increase, tool life and finish has been improved.

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

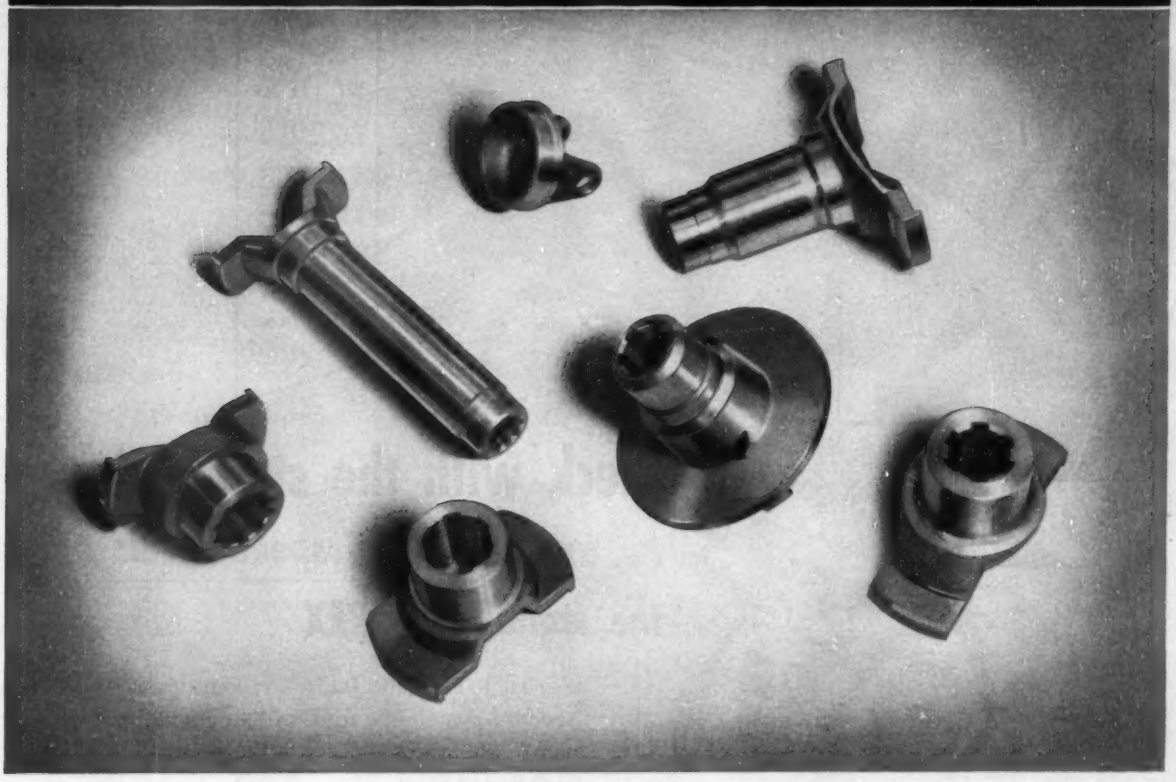
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







More Than 5 Times



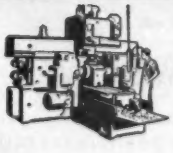
10 Different Jobs Turned In Lot Sizes of 500

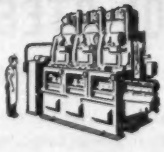
Operation for these yoke parts consists of turning the O. D. complete, using carbide tipped tools. Changeover time is *25% less* than with former method. One operator handles both machines. This is only one of many installations wherein Sundstrand Automatic Lathes have increased production. If you have turning operations, call in a Sundstrand engineer and get an "Engineered Production" analysis. There is no obligation for this service.

Additional Data

ADDITIONAL DATA on the complete line of Sundstrand Automatic Lathes is included in this new 32-page booklet. Write for your copy today. Ask for bulletin 150.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

check with the standard

... and with high speed steels the standard is REX

It's easy to check on Junior's vision these days with *standard* eye charts. And for half a century there's been a *standard* in tool steels, too — Crucible REX® High Speed Steel.

Try REX High Speed Steel in your own shop as thousands all over the world have done. Use it under the toughest conditions . . . compare its performance with all other high speed steels. You'll find that *absolutely nothing beats REX.*

That's because REX High Speed Steels are unsurpassed in structure, finish, carbide distribution, response to heat treatment and general uniformity. So, on your next purchase of high speed steel, specify REX — made only by Crucible.

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54 years of Fine steelmaking **TOOL STEELS**

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How should I buy machine tools?

Outright purchase?

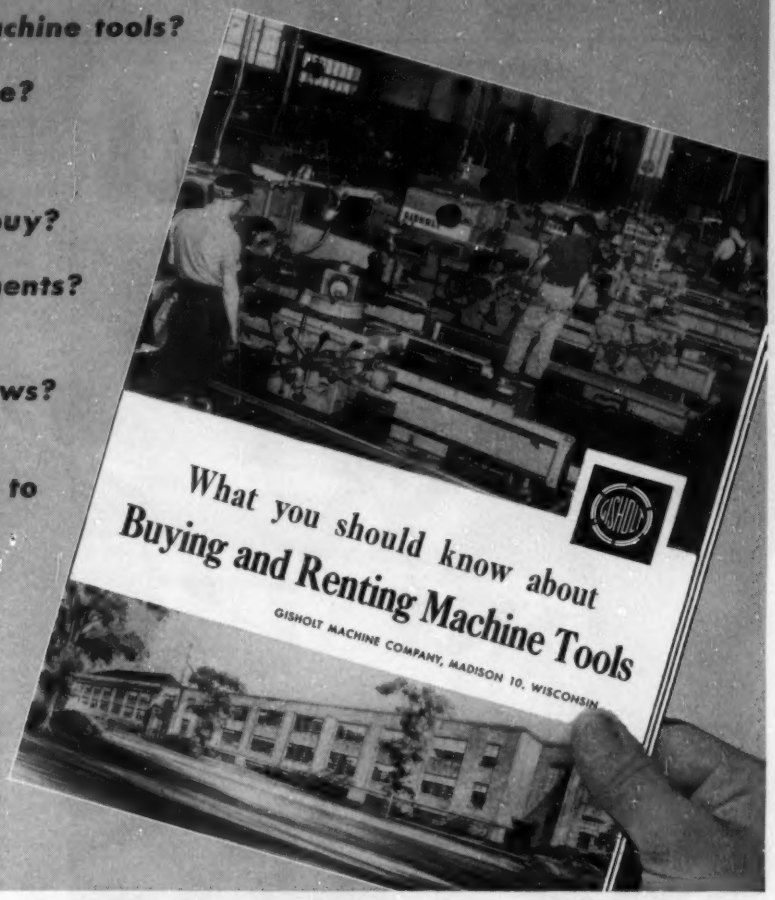
Should I Lease?

Lease with option to buy?

Buy on extended payments?

What about the new tax laws?

How can I know <u>when</u> to replace machines?



This New Gisholt Bulletin Will Help You

Recently, a lot of things have been happening which tend to confuse the outlook for buyers of machine tools and other industrial equipment. So Gisholt prepared this booklet to deal with the most important of them. The aim is to help you find the wisest answers in your particular case.

The booklet discusses leasing and time payment plans, makes cost comparisons, discusses depreciation under the new tax codes, replacement programs and the MAPI formula for machine replacement. A copy of this booklet is yours for the asking. No obligation, of course. Use the coupon.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

The Gisholt Round Table represents the collective experience of specialists in the machining, surface finishing and balancing of round or partly round parts. Your problems are welcome here.

TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Gisholt Machine Company 1201 E. Washington Ave. Madison 10, Wisconsin

Gentlemen:

☐ Please send me a copy of your new booklet on extended-payment and leasing plans.

☐ Please have a Gisholt representative call on me.

Name.....*Title*.....

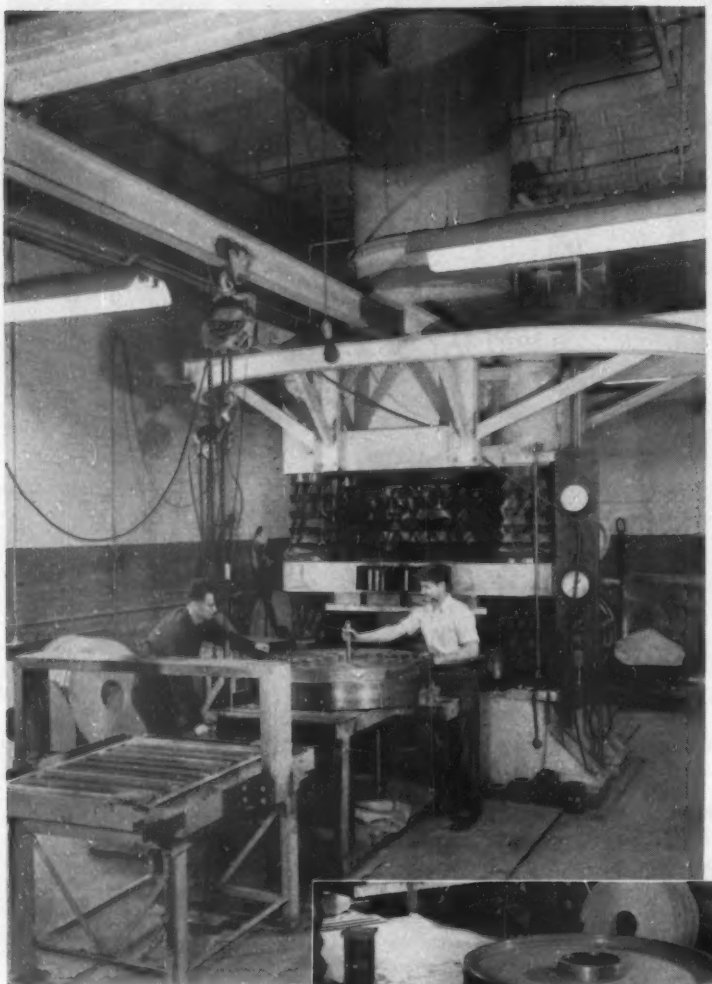
Company name.....

Street address.....

City.....*Zone*.....*State*.....

At MACKLIN COMPANY JACKSON, MICHIGAN

"Our ELMES Press has DOUBLED PRODUCTION on Large Grinding Wheels"



Above: Stripping the mold from a 42″ x 2″ x 12″ Macklin Grinding Wheel that has just been pressed on the Elmes 2000-Ton Forming Press. Photo at right shows the same wheel before pressing. The abrasive material has been leveled in the mold and is ready for the pressure forming operation.

The Macklin Company manufactures abrasive wheels in a complete range of shapes and sizes for all types of grinding work. One of their newest production aids for processing large wheels up to 48″ in diameter is the ELMES® 2000-Ton Abrasive Wheel Forming Press shown at left. The press is lever controlled with two pressures available. Its smooth performance and rugged construction has enabled the Macklin Company to *double their output* of large size wheels.

This actual "case history" in one particular field is typical of the outstanding performance of Elmes Hydraulic Presses of *every* type, such as metal drawing and forming, forcing, bending, straightening, forging, hobbing, etc. Whatever your operation, you *profit* when you "put your pressing problems up to Elmes".

Let Elmes assist you in selection or design of the right press for your production. Recommendations and cost estimates are yours for the asking.

HYDRAULIC PRESSES
(Standard or Custom-Built)
for:

DRAWING & FORMING
FORCING
BENDING
STRAIGHTENING
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in lubrication costs
MULTIPLY
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Be *sure* with Pure—Sales offices located in more than 500 cities in Pure's marketing area.

If your plant lubrication is complicated by dozens of different oils and greases, chances are, you're wasting valuable maintenance dollars and man-hours.

Right now's the time to SIMPLIFY your lubrication setup—*and watch savings multiply like magic*—with Pure Oil multi-purpose lubricants.

Each Pure Oil multi-purpose lubricant, you see, is scientifically compounded to perform *more* than one operation . . . job-proved to cut lubrication costs all along the line—from purchasing to inventory to application.

For complete information on this *sure* way to big savings, clip out the coupon and mail it today!

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FREE BOOKLET

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Please send me your free booklet on how to "Simplify and Save"

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NEW-NEW-

BULLARD

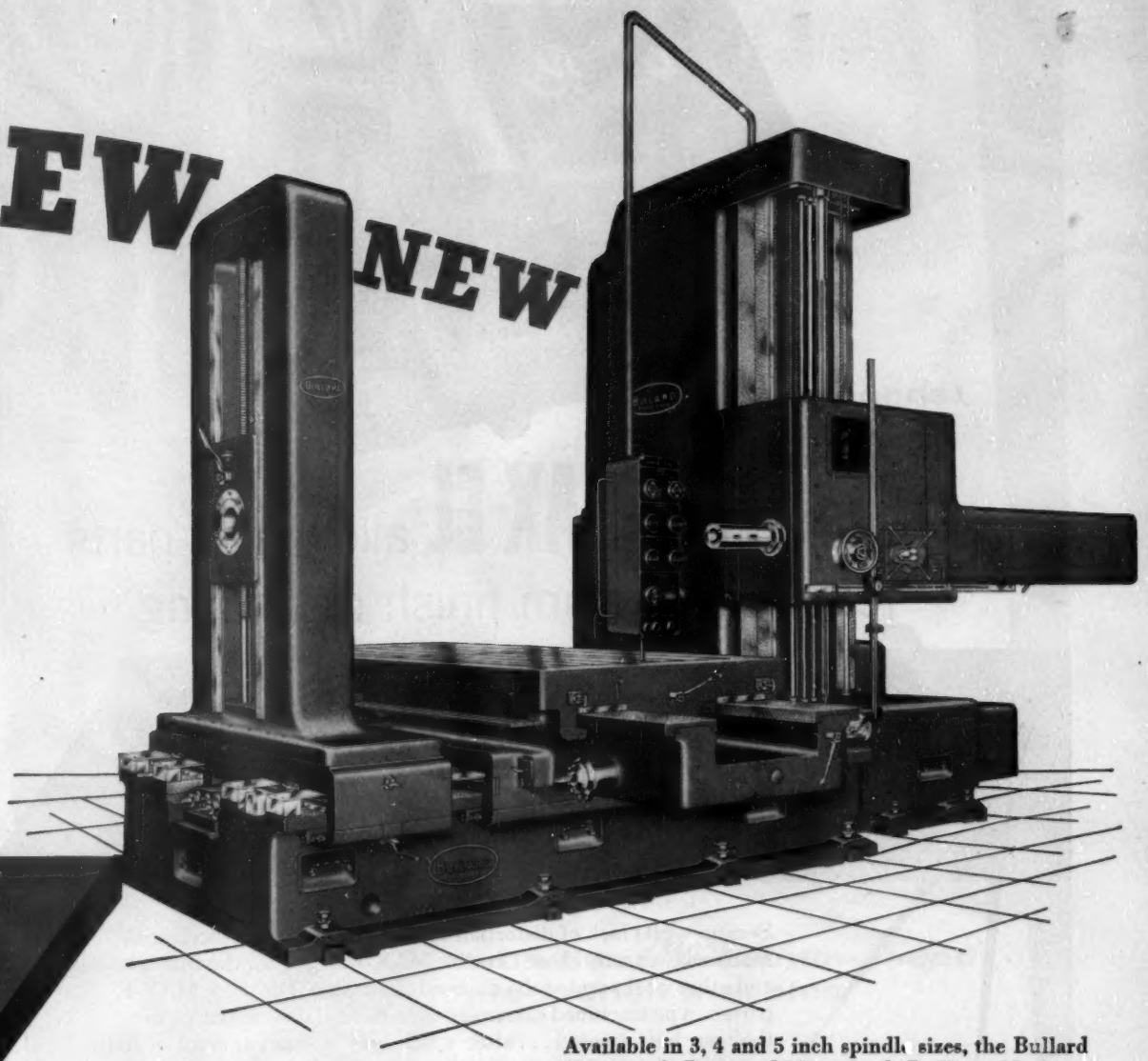
HORIZONTAL, BORING, MILLING and DRILLING MACHINES

Model 75

with improved features for increased production and efficiency, ease of operation and maintenance, greater rigidity, flexibility and capacity.

- **PENDANT CONTROL** — Exclusive Bullard design for complete machine control from a movable pendant station. Feed and speed rate selection, directional feed and traverse engagement of the spindle, head, table and saddle, spindle rotation and operation of head binders are accomplished from the Pendant. Interlocks and a stop-all stick provide safety for both operator and machine.
- **SCREW AND RACK FEEDS** — to the spindle provides smooth, steady screw feed for boring and sensitive hand feed for small drilling and tapping.
- **THE HEAD, HEADPOST AND REAR POST** are solidly built for maximum rigidity providing a higher degree of maintained accuracy under all operating conditions.
- **OPTICAL MEASURING EQUIPMENT** for head and table (optional).

NEW NEW



Available in 3, 4 and 5 inch spindle sizes, the Bullard Horizontal Boring, Milling and Drilling Machine, Model 75, is engineered to meet industry's present-day and future production requirements as it embodies the most modern machine design principles and techniques.

For the complete story use this coupon for your copy of the new catalog.

THE BULLARD COMPANY

286 Canfield Avenue • Bridgeport 2, Connecticut

Please send me a copy of the new Bullard Horizontal Boring, Milling and Drilling Machine, Model 75, Catalog today.

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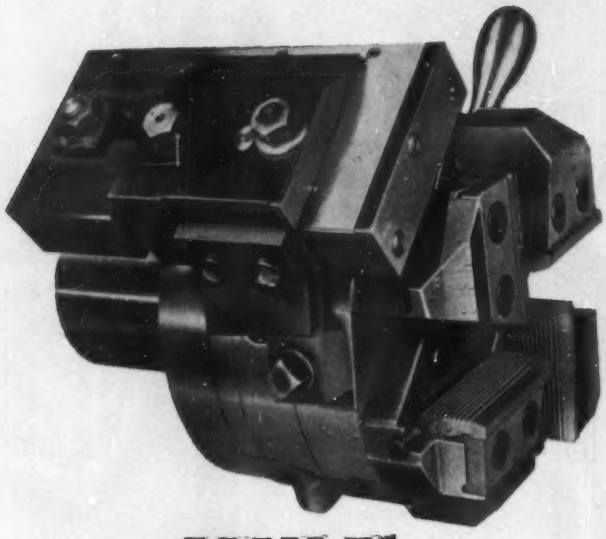
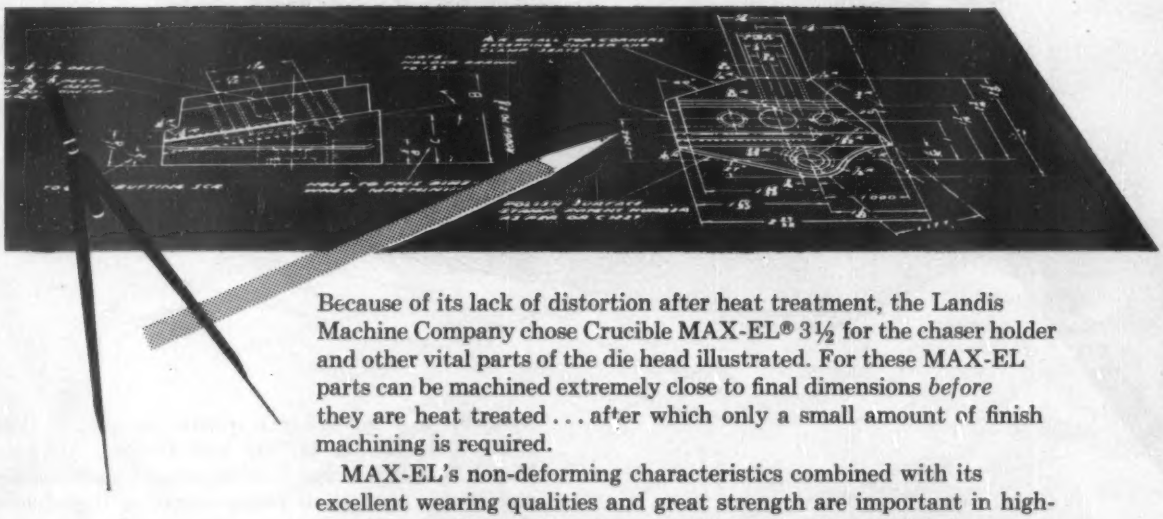
CITY..... ZONE..... STATE.....



Non-deforming **MAX-EL** alloy steel parts require minimum finish machining



Because of its lack of distortion after heat treatment, the Landis Machine Company chose Crucible MAX-EL® 3½ for the chaser holder and other vital parts of the die head illustrated. For these MAX-EL parts can be machined extremely close to final dimensions *before* they are heat treated . . . after which only a small amount of finish machining is required.

MAX-EL's non-deforming characteristics combined with its excellent wearing qualities and great strength are important in high-speed turret lathe die heads . . . and in many other applications.

Your shop will benefit, too, from the ease of machining, freedom from distortion, superior quality and longer tool life you get with MAX-EL. To start taking advantage of MAX-EL *now, call Crucible.*

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **ALLOY STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

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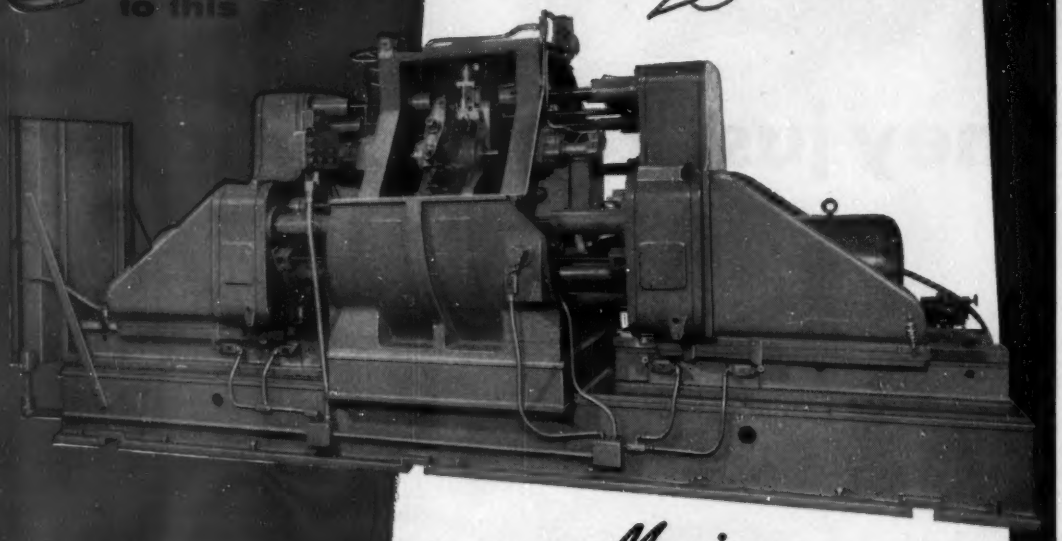
Canadian Distributor — Railway & Power Engineering Corp., Ltd.

...in just 23 seconds!



with this *Morris* mor-speed production machine

OPERATIONAL CYCLE: STATION	
1	Double Load and Unload
2	Drill four 1" holes
3	Re-drill holes to 1 7/16"
4	Rough face four holes
5	Finish face four holes
6	Chamfer four holes

The Morris Two Way Horizontal High Production Machine finishes universal joint flange yokes at the rate of 156 per hour at 100% efficiency.

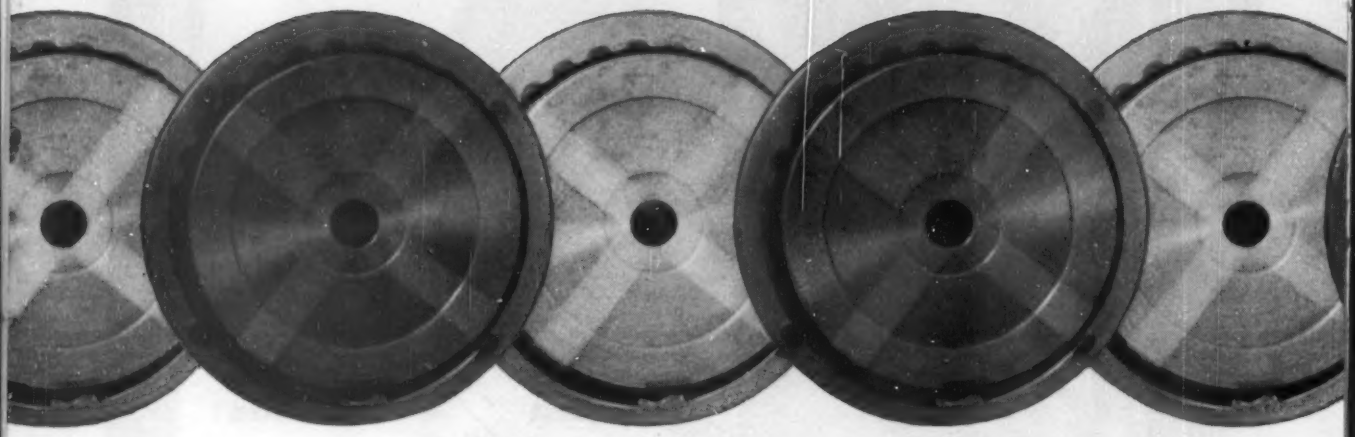
It, like other Morris MOR-SPEED Machines, is made up of standard MOR-SPEED units plus certain special parts. Because of Morris methods and standard designs, the user gets a special purpose machine . . . capable of high speed, precision production . . . without the usual sky-high cost and limited application of a "special machine."

Morris MOR-SPEED Machines save space, time and costs for leading manufacturers in every industry.

If you have multiple drilling, tapping, boring or similar operations on mass production basis, Morris Engineers may be able to show you substantial savings on a modest investment.

Morris

THE MORRIS MACHINE TOOL CO.
933 HARRIET STREET
CINCINNATI 3, OHIO



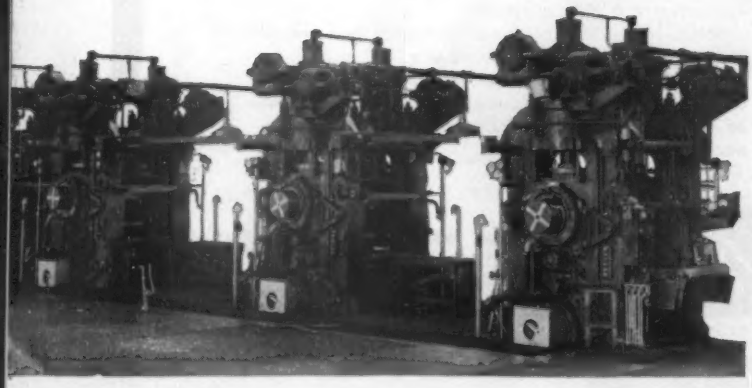
they just keep rolling along!

Oil changed only 3 times in 15 years

■ Here's the kind of a job where a lubricant either has to "put up" or get out.

Above and at right you see closeups of the tremendous bearings in the cold reducing mill of the Greer Steel Company, Anderson, Indiana. These are subjected to shock loads and continual extreme pressures. If there ever was an application where an oil has to prove itself beyond a question of a doubt this is it.

For the past fifteen years, STANOIL Industrial Oil #240 has been proving itself day in, day out by putting up the best lubrication possible on this tough job. *And yet, despite continuous hard operation, this oil has been changed only three times in this entire period!* The big bearings under continual heavy pressure have been successfully protected by STANOIL and have remained as good as new. Lubricant consumption has stayed low . . . with no evidence of *any* sludge or varnish formation. Periodic checks by the Standard Oil Lubrication specialist insure the continued like-new quality of the oil. That means that these vital mills will keep rolling along free from *any* lubrication difficulties.



Standard Oil lubrication specialist Don Wilson puts his training and experience to work to help Greer maintain economical, trouble-free operation. For help with *your* lubrication program call your nearest Standard office or write to Standard Oil, Chicago.

STANOIL

TRADE MARK

Industrial Oil

STANOIL Industrial Oils are versatile, multi-purpose oils designed to do a variety of jobs in a wide range of equipment. STANOIL can simplify stock, storage, and inventory in your plant by replacing many special-purpose oils you may now be using on air compressors, reduction gears, electric motors, auxiliary turbines and other equipment. For sure protection and better operating economy check today on the superiority of STANOIL.

STANDARD

STANDARD OIL COMPANY

(Indiana)

WHY IT PAYS TO BUY MECHANICAL TUBING FROM US

You can reduce storage space, increase productive area

● There's no need of sacrificing large areas of valuable floor space for tubing storage when those areas *could* easily be made productive. Why not let *us* carry the storage and handling costs?

Our warehouses stock an exceptionally large variety of tubing products . . . in fact, no less than 531 sizes of Shelby Seamless Mechanical Tubing are readily available! So you can always count on quick delivery of exactly the type and size tubing you need . . . whether your order is by the inch or by the carload. And all our tubing products are made by the world's leading manufacturer of fine tubing and pipe —National Tube Division of U. S. Steel.

And, our extensive experience with tubing problems has often led to customer savings. For in many cases, our engineers can suggest a more economical type of tubing for your application.

Contact our nearest warehouse the next time you need quality tubing of any sort and in any quantity from our stock or directly from the mill: mechanical tubing, round and square, seamless and welded; boiler tubing, pressure tubing and pipe; and stainless steel tubing and pipe, seamless and welded.

TRIPLE SECURITY

What you want
When you want it
At the right price

U. S. STEEL SUPPLY
DIVISION

General Offices
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices
Coast to Coast

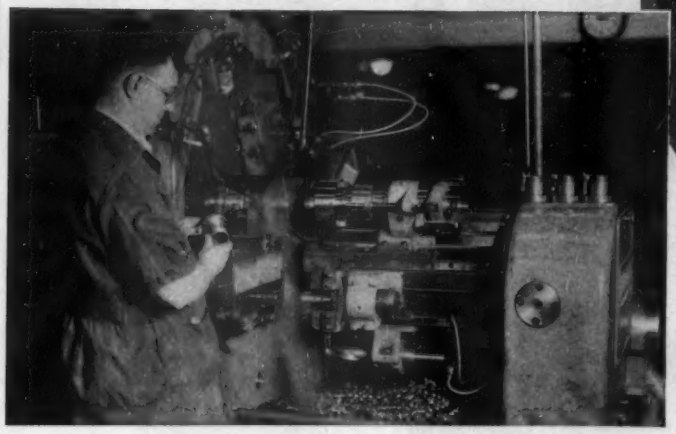
USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

Baker INDUSTRIAL TRUCKS tells us...

"we used to average 2 of these pieces per hour ...from 2 machines with 2 operators

now we get 10 pieces with just 1 machine and 1 operator..."



This commutator core, actual size, is completed in one set-up with HS tools. Close reaming, trepanning and class 3 thread are required.

. . . on the Model M Bar Type Acme-Gridley Automatic Turret Lathe

Another case-history report, this time from Baker-Raulang, Cleveland, O., one of the most experienced (101 years old) makers of power industrial trucks and tractors.

This 5 to 1 production gain is the average, though we can show you where and how other Model M customers are getting as much as 10 times their former output. And we believe that such down-to-earth documented evidence far outweighs vague promises, hearsay or experimentation at your expense.

May we give you more information, especially figures on your specific single spindle jobs? Why not let us show you what this machine actually has accomplished... with carbide tooling, easy change-overs, operating conveniences... performance facts that make such claims of highest output at lowest costs a REALITY?

If this bar machine offered ONLY

predetermined automatic control of the job time-cycle...

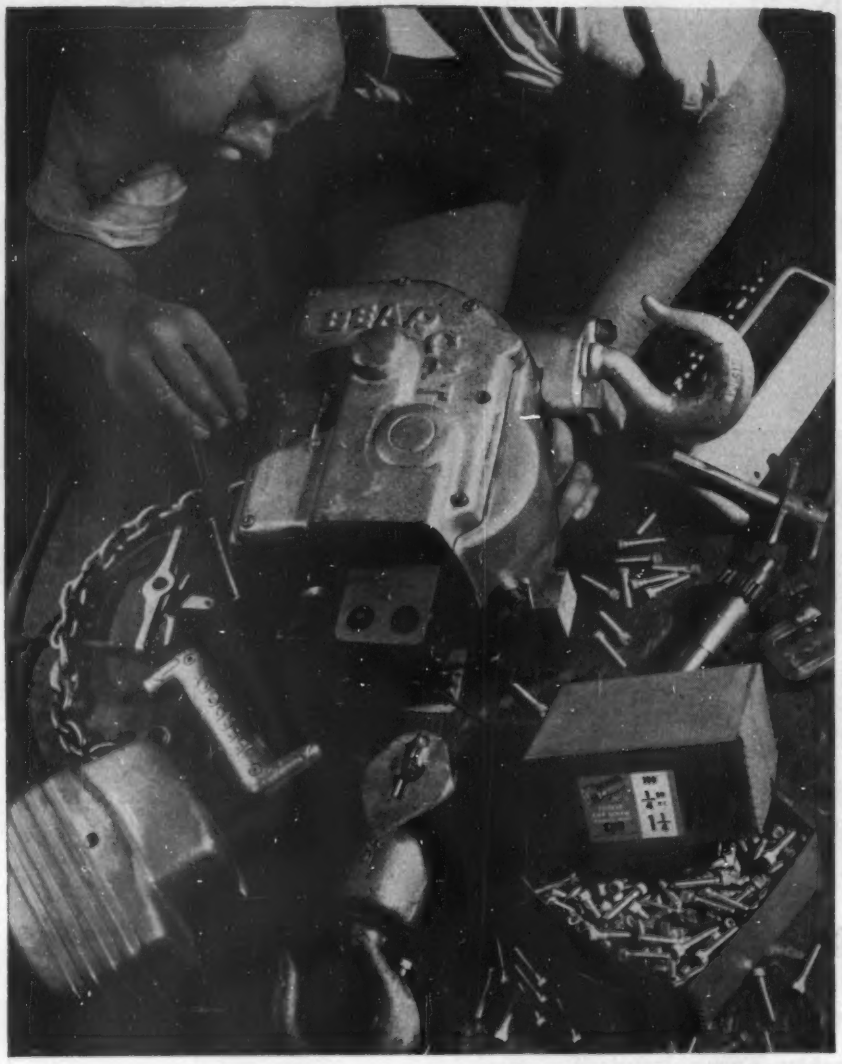
this complete machining of every piece at the same predetermined rate at the end of a shift as at the start would mean faster and more accurately scheduled production. But, when additional operations can be put on to complete the job, or more nearly complete it, on ONE machine—and eliminate present unnecessary added cost for extra man hours and release these extra machines and floor space to other needs—THEN certainly it is important that you have such guarantees to make comparisons on your own work.

The NATIONAL ACME COMPANY

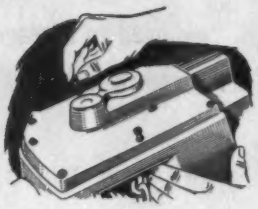
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

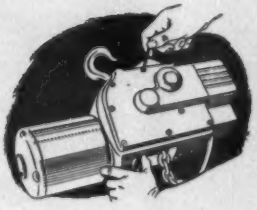
Remember—You can't do **TODAY'S JOB** with **YESTERDAY'S TOOLS**... and be in business **TOMORROW**



23 UNBRAKO Socket Head Cap Screws are used to assemble this lightweight, high efficiency electric hoist. They were selected for their uniform accuracy and high tensile strength.



The knurling on the head of UNBRAKO Socket Head Cap Screws permits faster assembly, because of the positive slip-proof grip.



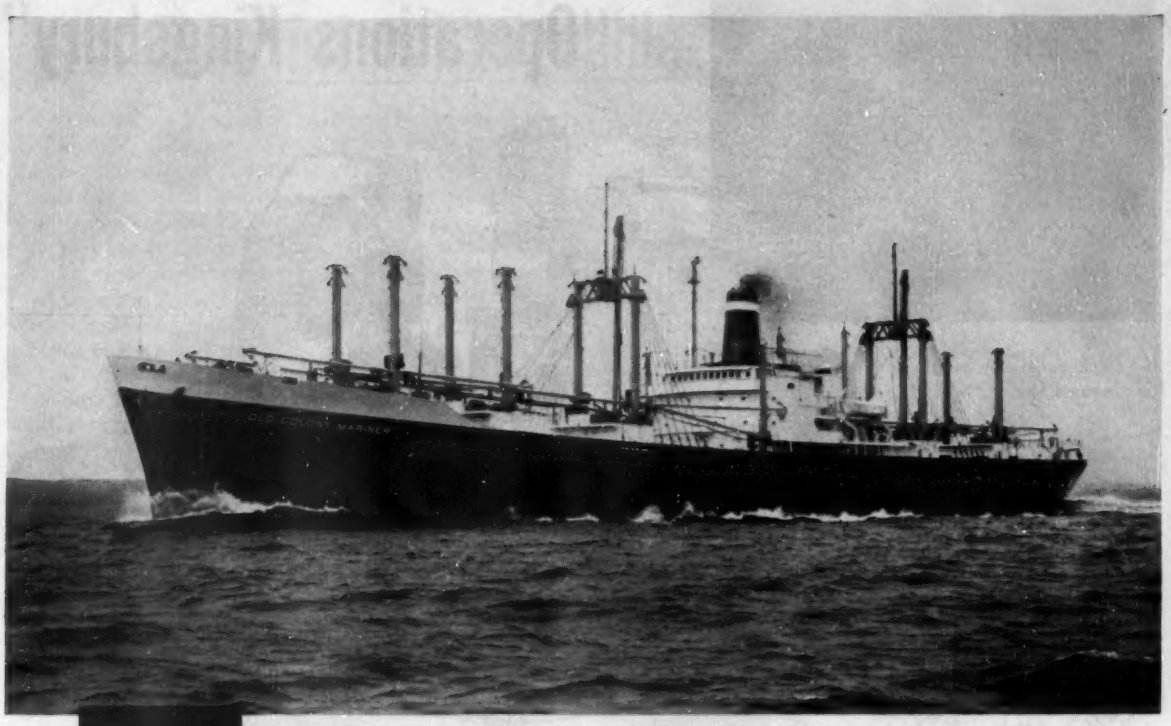
The uniform depth and size of the hex socket assure strength and maximum torque in wrenching—extremely important in the cap screws used to fasten assemblies like this.

UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; controlled fillet and continuous grain flow for strength. In standard sizes from #4 to 1".

Save time and money by using UNBRAKO Standards...stocked by your distributor

You'll have less money tied up in inventory, you'll need less space for storage, you'll get personalized service and faster deliveries. And you'll be buying the finest socket screw products that modern machines, complete facilities and quality control can produce. Write for UNBRAKO Standards, a complete listing of socket screw products made by the world's largest producer. STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

UNBRAKO SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA



Nebel LATHES CINCINNATI

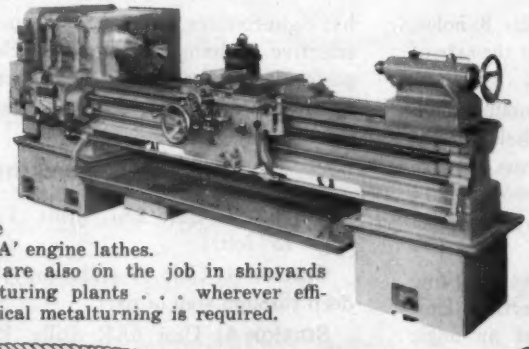
biggest lathe value ...ashore or afloat!

Nebel lathes perform so well, they've won a place with sea-faring men. Built to turn the widest possible range of work, they're often called "the workhorse of the marine machine shop."

Equally significant is the work Nebel lathes perform ashore. Pound for pound they can't be beat for power and speed, ease of operation and long-wearing qualities. They're in use in every important U.S. shipyard, in every important industry in the world.

Nebel lathes are made in three styles: heavy duty engine, removable block gap and extension bed gap. Swing sizes 16″ to 50″. Backed by 55 years of lathe building experience . . . backed by a company that still prides itself on old-world craftsmanship.

25 NEW MARINER SHIPS

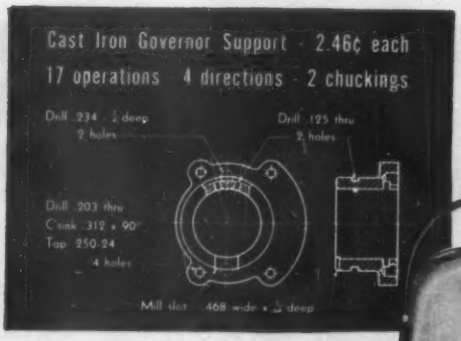


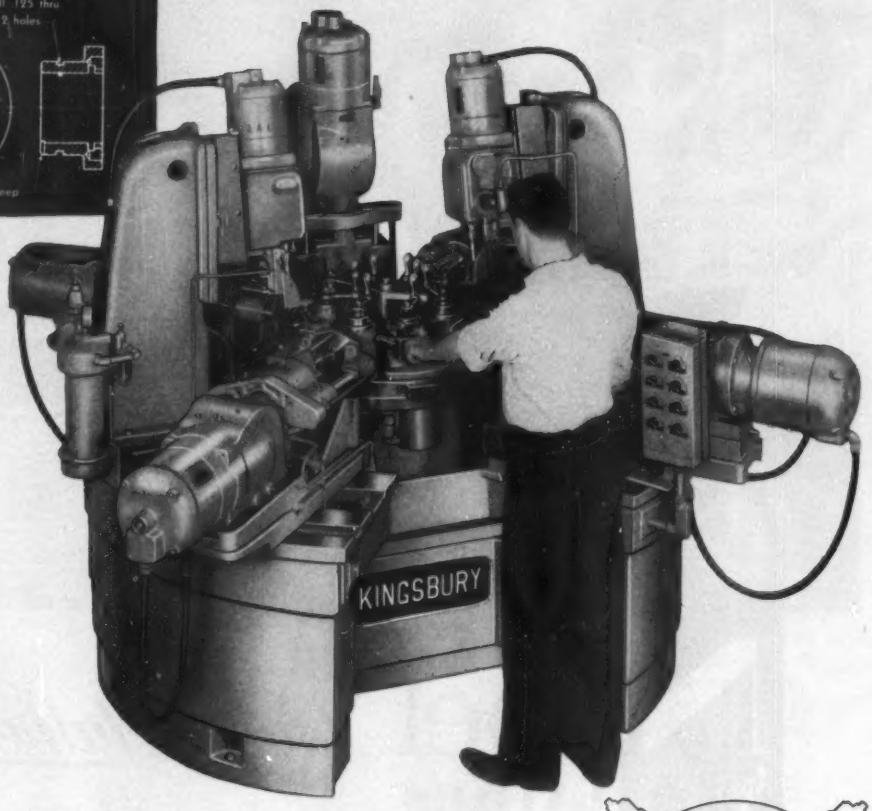
depend on the new Nebel 'LA' engine lathes. Nebel lathes are also on the job in shipyards and manufacturing plants . . . wherever efficient, economical metalturning is required.

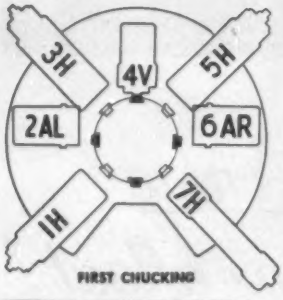
BIG LATHE —SMALL INVESTMENT

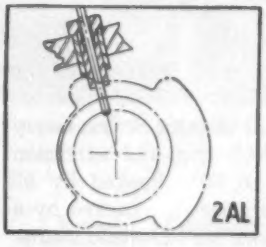
How can lathes offer so much capacity, power, speed and accuracy—how can they be so good and yet cost so little? This interesting 20-page booklet tells the whole story. Send for your copy today without obligation. The Nebel Machine Tool Co., 3407 Central Pkwy., Cincinnati 25, O.

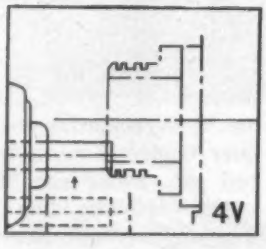
"Operations Kingsbury"

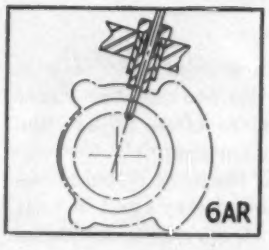

Cast Iron Governor Support - 2.46¢ each
17 operations - 4 directions - 2 chuckings
Drill .234 - ¾ deep
2 holes
Drill .125 thru
2 holes
Drill .203 thru
C'sink .312 x 90°
Tap .250-24
4 holes
Mill slot .468 wide x ⅜ deep

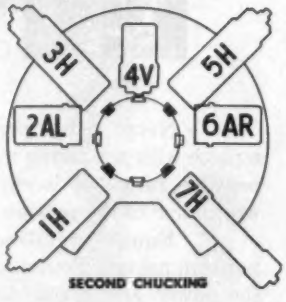












Follow this Kingsbury Automatic Machine as it performs

Actually better than that! It drills 8 holes, c'sinks and taps 4 of them, and mills a slot at the rate of 218 pieces per hour gross.

The part is a cast iron governor support small enough to palm in your hand. Print calls for 8 holes and a milled slot — 17 operations from 4 directions. Three operations are required at one end of the piece and 14 operations at the other. It was decided to accomplish these on one machine in two chuckings.

The machine has an 80-inch base with seven working units: four Horizontal Units (H), one Vertical Unit (V) and two units operating downward at an angle (AL left and AR right). The 30-inch Index Table has eight fixtures, four for each chucking. By means of selective tripping, the first chucking operations are performed at Stations 2, 4 and 6; the second chucking operations are performed at Stations, 1, 3, 5, and 7.

First Chucking

Station 2: Unit 2AL drills .125 hole through at angle 15° left.

Station 4: Unit 4V mills slot .468 wide x 5/64 inch deep through wall of part.

Station 6: Unit 6AR drills .125 hole through at angle 15° right.

produces interchangeable parts at low cost

"Operations Kingsbury" will provide you with parts of uniform accuracy . . . parts which will slip into your assemblies without reworking. Your part can be of any material that can be machined within the limits of 5 HP units and handled by one operator.

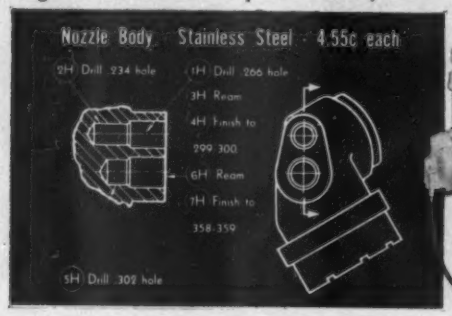
This broad claim is based upon field experience with more than 4,000 custom-built Kingsburys; a plant equipped with the most modern machine tools; a staff of experienced engineers and craftsmen specializing in this one line; and pride in doing it well.

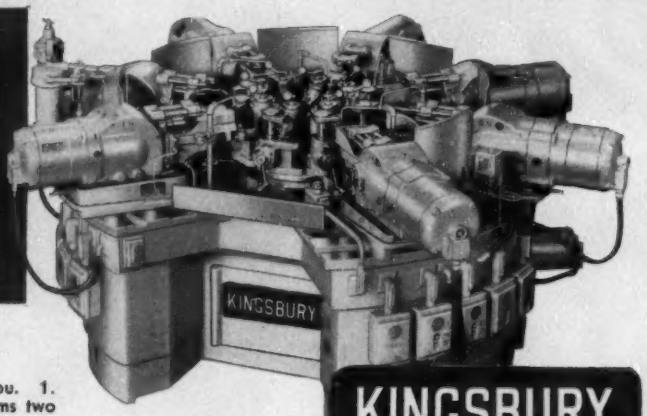
Accuracy begins at home. Precision-built work-holding fixtures locate the part correctly for each tool. Precision ball bearings and bushing guides insure close tolerances. Predetermined feeds and speed are uniform and constant: multiple spindle heads are used only when it is safe to do so.

"Operations Kingsbury" offer additional money-wise advantages. Your scrap loss will be reduced to a minimum. You'll save floor space, set-up time and intra-machine rehandling.

Are you a good prospect? If so, we should like to see you.

Kingsbury Machine Tool Corp.
106 Laurel Street, Keene, N. H.



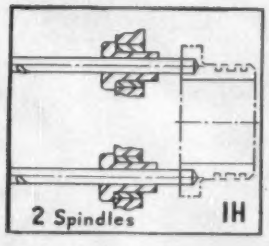


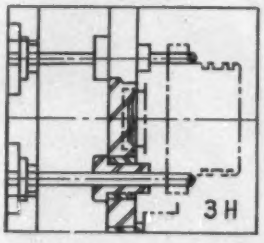
Stainless Steel Nozzle Body
21 operations per minute

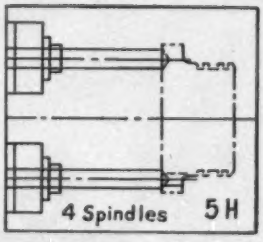
This Kingsbury holds three points of interest for you. 1. It drills stainless steel at 66 FPM. 2. It finish-reams two holes to ±.0005 on diameters. 3. It averages 1,274 operations per hour, producing 182 pieces gross.

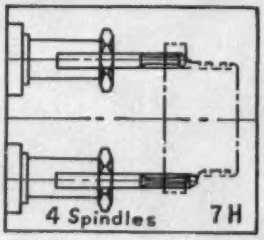
The machine has an 80-inch base with seven horizontal work units, all radial. The 24-inch index table has eight work fixtures, one for loading and unloading; and indexes clock-wise through 8 stations. Bushings guide all drills and reamers.

KINGSBURY
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production









17 operations at an average of one every second!

Second Chucking

Operator removes part and reloads with a new part placed end for end in work fixture as shown in the plan view.

Station 1: Unit 1H with two-spindle head drills two .234 holes ¼ inch deep.

Station 3: Unit 3H with four-spindle head drills four .203 holes through.

Station 5: Unit 5H with four-spindle head c'sinks .312 x 90° the four holes drilled at Unit 3H.

Station 7: Unit 7H with four-spindle head taps the four holes with .250 — 24 Taps.

Parts for both chuckings are loaded and unloaded at eighth position during machining cycle. Bushings guide all drills.

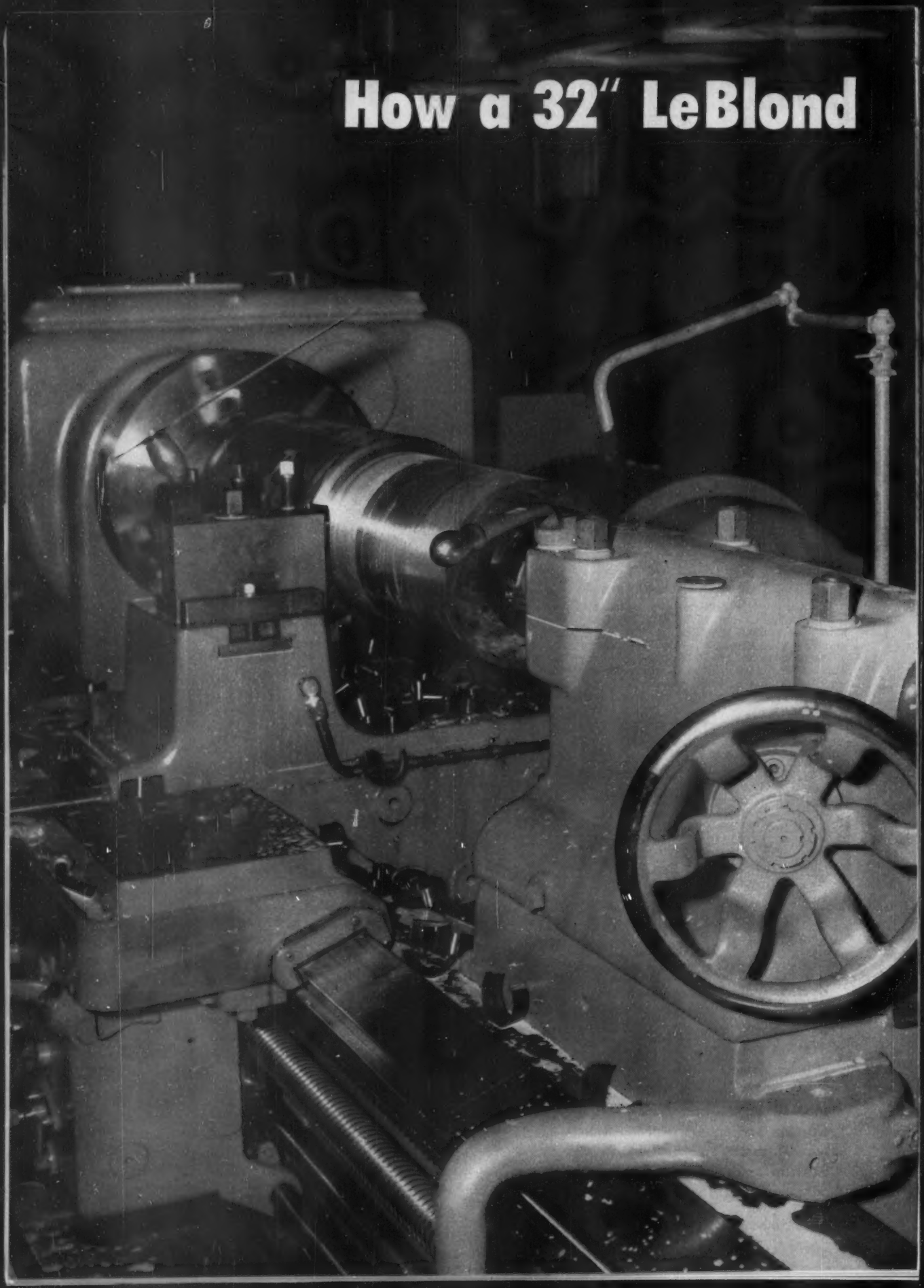
Each Unit Cost on the drawings
includes the cost of the man and of the machine — no power or overhead. We assumed:
Unit cost of man equal to:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$

Unit cost of machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$

How a 32" LeBlond



takes a measured 118-HP cut

Wanted. *A 32″ lathe to stand up under 100-plus horsepower cuts. Must also provide unusually-wide range of feeds and infinitely-variable speeds.*

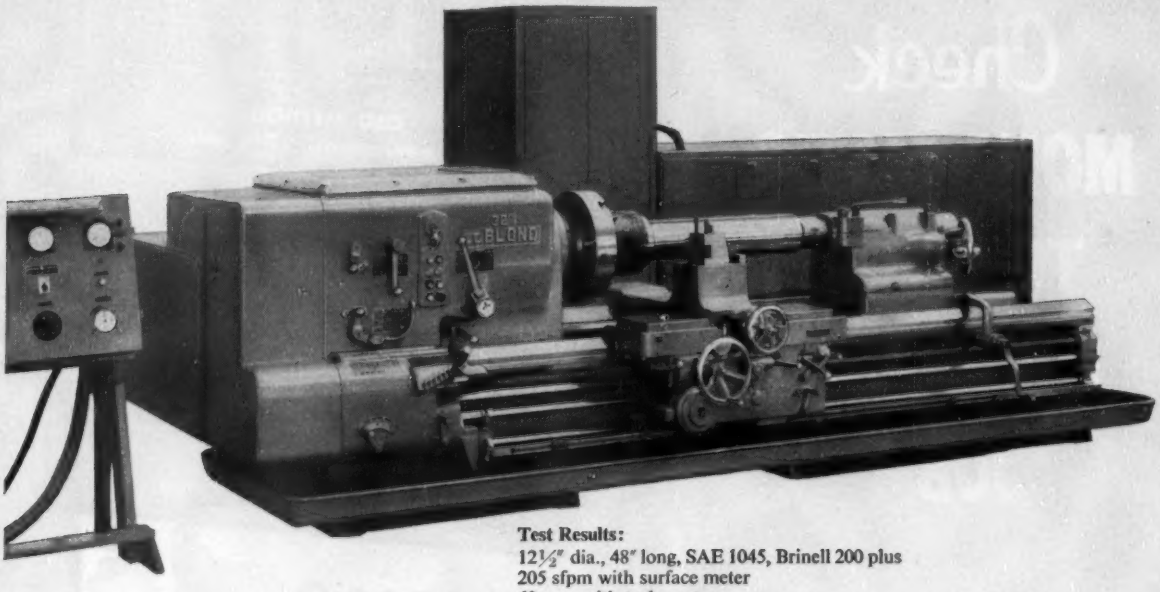
No standard model could fill these requirements. But our new 32″ Heavy Duty had the ruggedness that was needed. We made some changes, mainly in the headstock, and produced a 32″ lathe with these specifications:

Drive; 125 hp, variable speed.

Speeds; infinite from 42 to 1400 rpm.

Feeds; 56 from .002 to .250 ipr.

Plus these features that are standard on our 25″ and 32″ lathes: 4-directional power rapid traverse built into apron; one-piece double-wall apron, hardened rack; totally-enclosed quick-change box; hardened and ground replaceable steel bed ways; thrust-lock tailstock.



Test Results:
12½″ dia., 48″ long, SAE 1045, Brinell 200 plus
205 sfpm with surface meter
63 rpm with tachometer
.083″ feed per rev.
1″ depth of cut
2 hp reading on meter before cut
120 hp reading on meter during cut
118 net hp at the cut

This lathe, with variations to suit your needs, is now available. It appears to be well-suited to very high production turning of large forged or cast-steel shafts and rolls. For quotations against your specifications, get in touch with the nearest LeBlond Distributor or write Cincinnati direct.

. . . . cut with confidence

LeBLOND *of Cincinnati*

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 67 YEARS.*

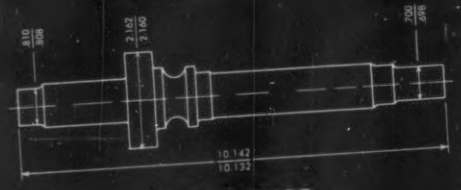
SUGGESTION BOX

Check MONA-MATIC TURNING FOR YOUR JOB

MONA-MATIC METHOD
2 operations, 11 1/4 min.

OLD METHOD
10 operations, 81 1/2 min.

MONA-MATIC METHOD
2 operations, 6 3/4 min.



OLD METHOD
11 operations, 27 3/4 min.

MONA-MATIC METHOD
2 operations, 4 min.

OLD METHOD
12 operations, 22 1/4 min.

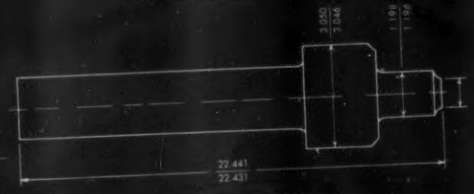
MEMO

All parts are AMS 6260 forgings. Because they are partially restricted, they cannot be identified by name. In every case, a limit of ± .001" is held on all diameters and dual template control employed. In addition to the tremendous reduction in time, *setup time has been reduced to a marked degree* and *tool costs are much lower*. A further advantage of the Mona-Matic method is the fact that *many grinding operations, heretofore necessary, have been eliminated*. While these 5 examples of time saving are extraordinary, it is a matter of record that the time saving on 22 other jobs, run over the same machines, ranges from 50 to 70%.

Want the facts on Mona-Matic turning? High time! Send the coupon for illustrated brochure with complete data, specs., and job reports.
The Monarch Machine Tool Company, Sidney, Ohio

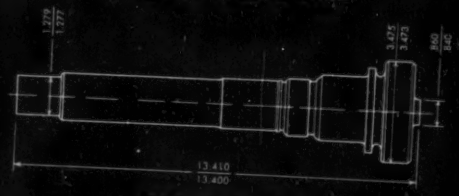
BULLETIN BOARD

MONA-MATIC METHOD
3 operations, 12 min.



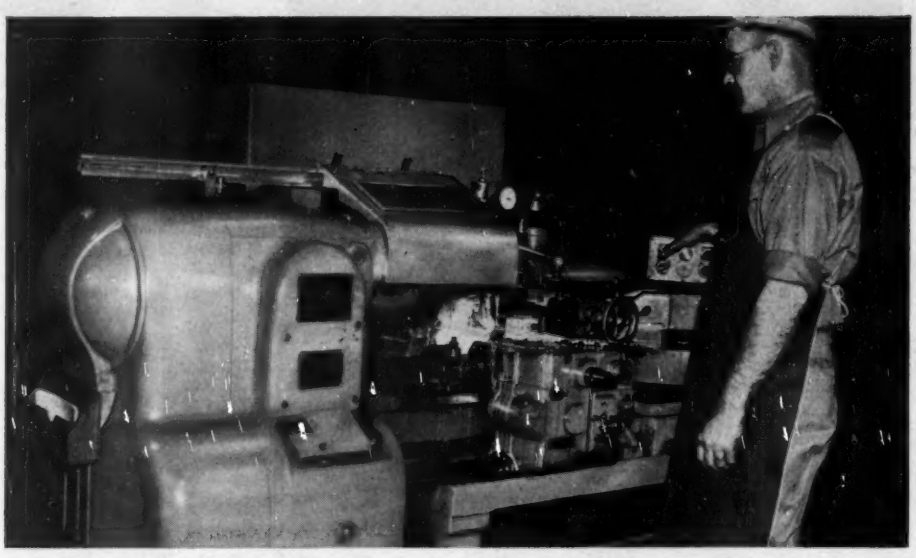
OLD METHOD
11 operations, 63½ min.

MONA-MATIC METHOD
2 operations, 8 min.



OLD METHOD
12 operations, 41 min.

TURNING NEWS



THE MONARCH MONA-MATIC

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Gentlemen: I am interested in your Mona-Matic story and would like to receive your illustrated Booklet, with complete data and job performance reports. Please send me your Booklet 1805.

NAME_____ TITLE_____

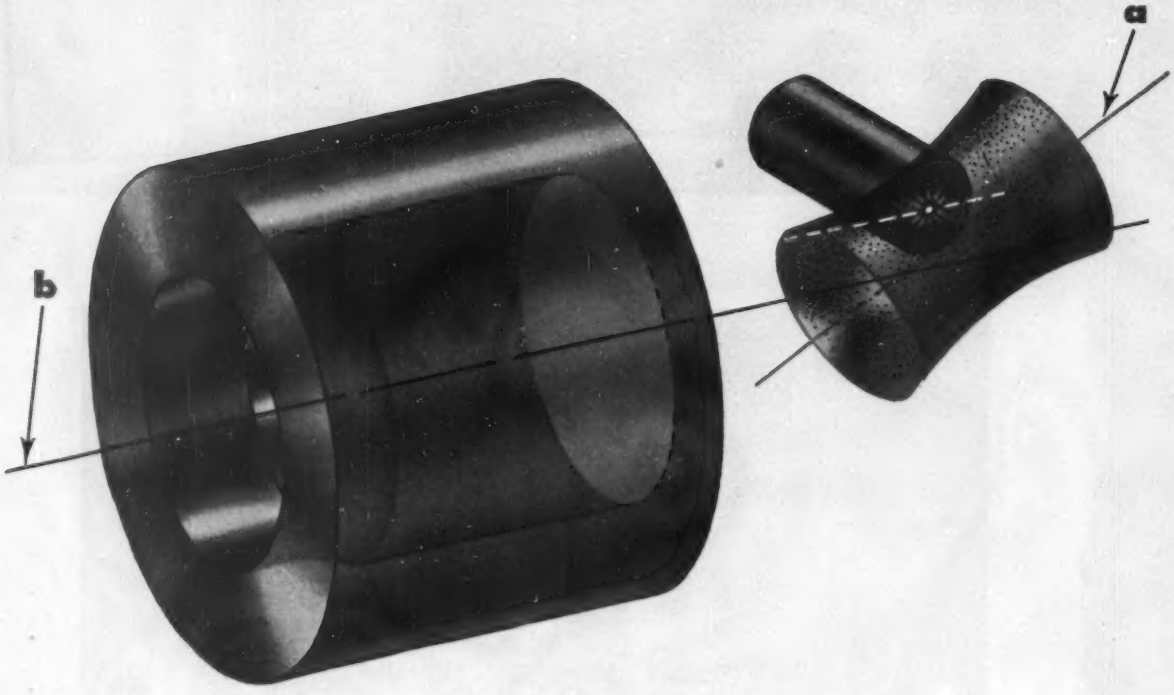
COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

alignment

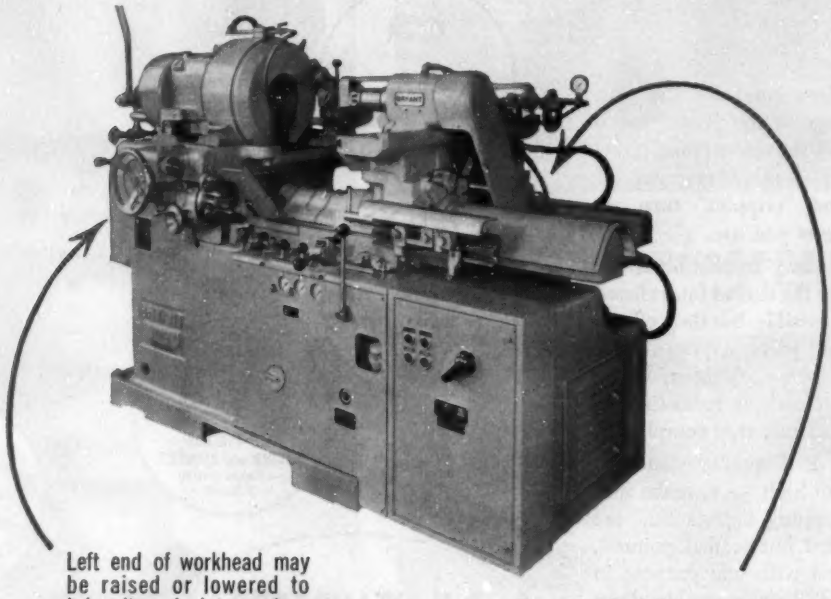
for better internal grinding



IT is generally believed in internal grinding that once the grinding wheel passes the diamond, the form of the wheel will be a perfect cylinder. In our illustration the wheel is tipped as it passes the diamond and an hourglass form is generated on the wheel. This condition is not peculiar to an internal grinder. The same form is generated in turning an O.D. on a lathe if the tailstock is either high or low.

The path of the diamond is a straight line across the surface of the wheel, but the wheel will not contact the work on the same straight line. Contact may be at a point on each end of the wheel. Since the wheel does not contact across its full face, wheel wear will be excessive and the wheel will act soft.

The geometry of the hole may be upset as in the illustration, with the result that the back of the hole will be tight. Neither turning the workhead nor changing the length of traverse will correct this error. Because the wheel is contacting at either one or two points, instead of a straight line, the surface finish will be poor. The remedy is to correct the alignment by bringing the wheel center line "a" parallel with the path of the wheel and in plane with the work center line "b".



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with the wheel path.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16″ with 12″ max. hole depth. Write for folder.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

Bryant Chucking Grinder Co.

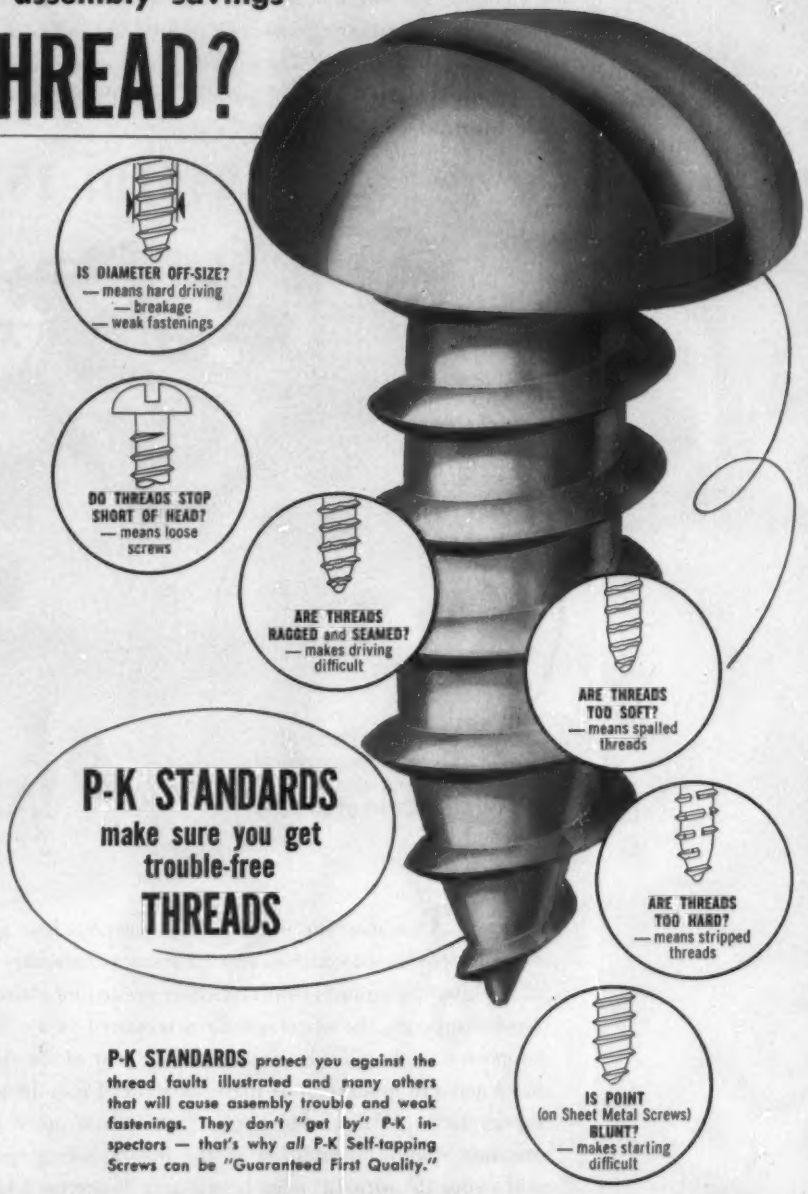
Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

Are You BARRED

from planned assembly savings

BY A THREAD?



No MATTER how carefully you plan to take advantage of the proved speed and simplicity of the self-tapping screw *method,* your planning won't pay off if "softies" and "cripples" turn up among the screws you use.

Screws can be "trouble-bent" in many ways. Like the thread faults listed here, most are invisible, but their effects (job slowdown, parts spoilage, high reclamation expense, hidden weakness) show up clearly in mounting assembly costs and customer complaints.

That's why P-K quality standards have been set so high — to make sure you get Self-tapping Screws that are not only threaded, but headed, pointed, and heat-treated with one purpose in mind, to keep your assembly lines trouble-free.

P-K Self-tapping Screws are the leading choice of experienced specialists who plan assembly of America's best known products. Follow their lead . . . for day-in, day-out dependability, specify P-K. For information on any fastening problem, talk to a P-K Assembly Engineer . . . Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14. Chicago Warehouse, 4331 West Lake St., Chicago 24.

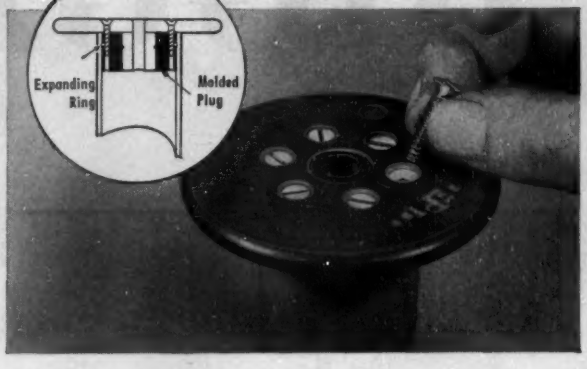
P-K STANDARDS protect you against the thread faults illustrated and many others that will cause assembly trouble and weak fastenings. They don't "get by" P-K inspectors — that's why *all* P-K Self-tapping Screws can be "Guaranteed First Quality."

PARKER-KALON

IN STOCK . . . see your nearby P-K Distributor . . .

SOLDERLESS BATTERY TERMINAL assembly by Triple-A Co. was reduced from 5 to 2 operations when P-K Hex Head Type F Screws were adopted as clamp fastenings. Screws clear cored holes as they are driven by automatic machines — eliminate drilling, tapping, and awkward screw handling. They provide firm, sure grip on terminal, yet can be removed and replaced if necessary.

EPI BOBBINS, products of Engineered Plastics, Inc., must withstand extreme end pressure of nylon and other synthetic yarns under tension. Six P-K Type F-Z Screws fasten each laminated phenolic flange securely. Power-driven screws tap into Durez plugs and "cam out" patented expansion rings to lock barrel to core — can be removed.



with P-K quality–planned assembly savings pay off

EASTMAN KODAK speeds up assembly of the Kodalite Flashholder by using P-K Self-tapping Screws. Troublesome tapping of small holes in plastic is eliminated. Screws are driven with hopper-fed automatic machines, removing necessity for tedious screw handling and placement. Two P-K Phillips Head Type F Screws fasten a cover mounting bracket to the flashholder case (right) and three more fasten the metalized Tenite II reflector to the case (left). Case is a thermo-setting phenolic. Screws hold firmly under all stresses of normal use, can be removed for attachment of new reflector.

The First originated by P-K . . . and First Today . . . the leading choice for fastening economy

SELF-TAPPING SCREWS

your local Supply and Service Specialist

BIGGEST!

This Betts 100 Inch Worm and Rack-driven Slotter is the largest ever built in America.

It is more than 30 feet high and weighs over 140 tons.

The table has a load carrying capacity of 75 tons and the bed measures 9 feet across the ways.

Seventeen motors are required for its operation.

CONSOLIDATED MACHINE TOOLS

This big Betts Slotter has a reversing planer-type variable-voltage motor drive. All machine functions are push button controlled and the circular work table has General Electric ultra-precise electronic indexing.

CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

CORPORATION, ROCHESTER, N.Y.

Birmingham Company, Incorporated.

52″ swing plus...

... plus 27½″ grinding head stroke, 24¾″ clearance over face plate, 42″ diameter face plate—on Springfield's new Vertical Universal Grinder. The work piece on the grinder here is a washing machine agitator mold, 43″ corner to corner. A tapered hole through it must match a conical male part (small illustration). One angle setting of the head ground both male and female taper for perfect fit. It had been planned to hand-lap them, a week's task. Springfield's time: 4½ hours.

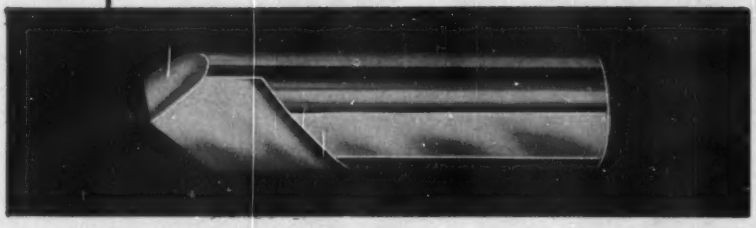
Other Springfield Vertical Universal Grinders—swings 21″ and 30″.
Lathes—toolroom, engine, contouring, reproducing—14″ to 32″.
Write for name of nearest Springfield dealer.

67TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

SPRINGFIELD

ATRAX IN ACTION



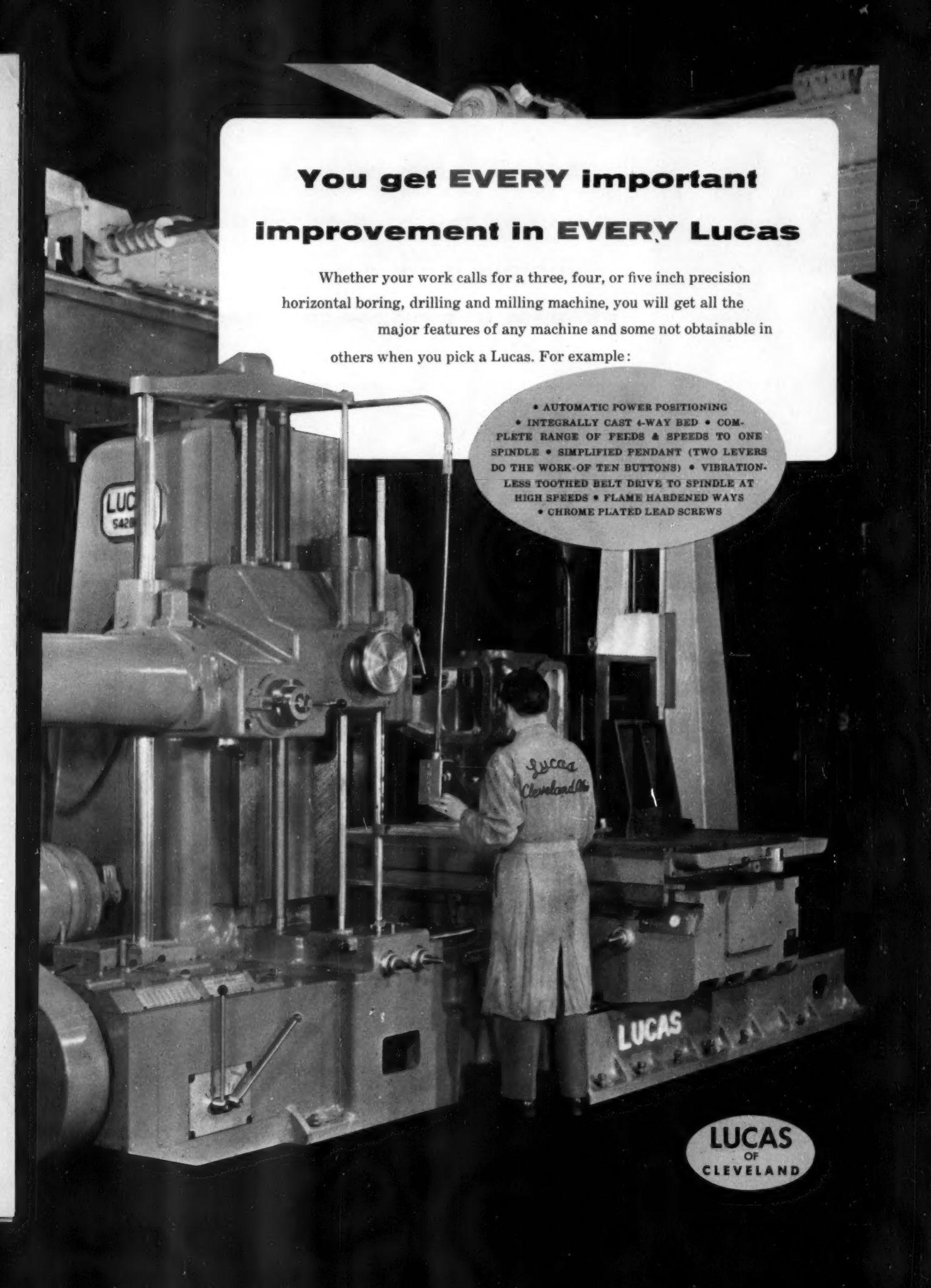
RECORDS SHOW 500% INCREASE IN PRODUCTION WITH IMPROVED BORING TOOL BIT

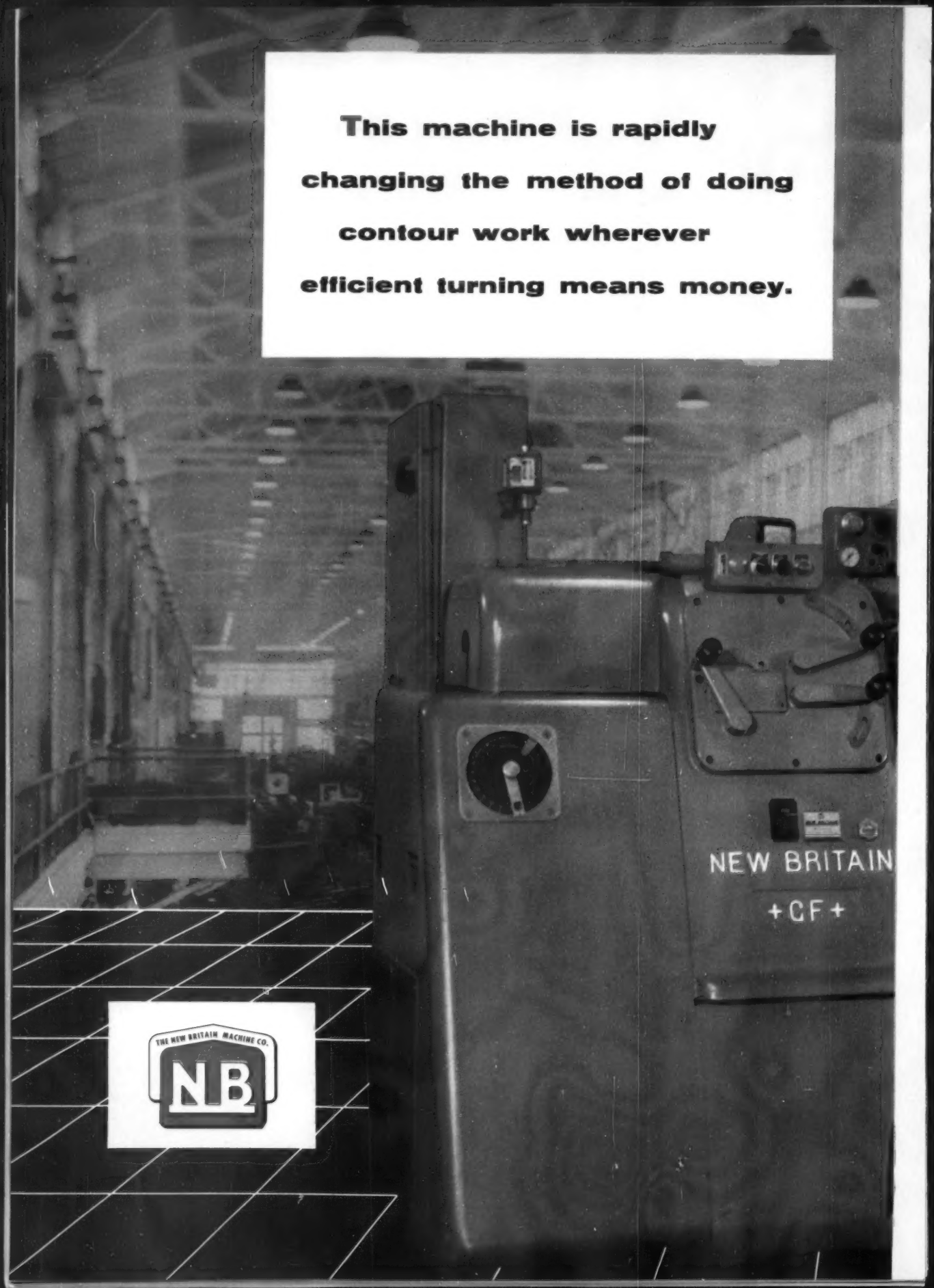
A CASE HISTORY: One of our customers had experienced considerable difficulties in boring tapered holes in stainless steel. The specifications called for extremely close diameter and taper tolerances, and a finish requirement of ten micro-inch. The carbide tool previously used gave the customer a production of one piece part, containing eight holes, per eight-hour day. With the new Atrax superior finish ground boring bit, production increased to about five piece parts per day. One tool bit roughed out and finished eight holes before resharpening was necessary, and the finished product was eight micro-inch or better. Atrax Solid Carbide Tool Bits improved production in this instance by over 500%.

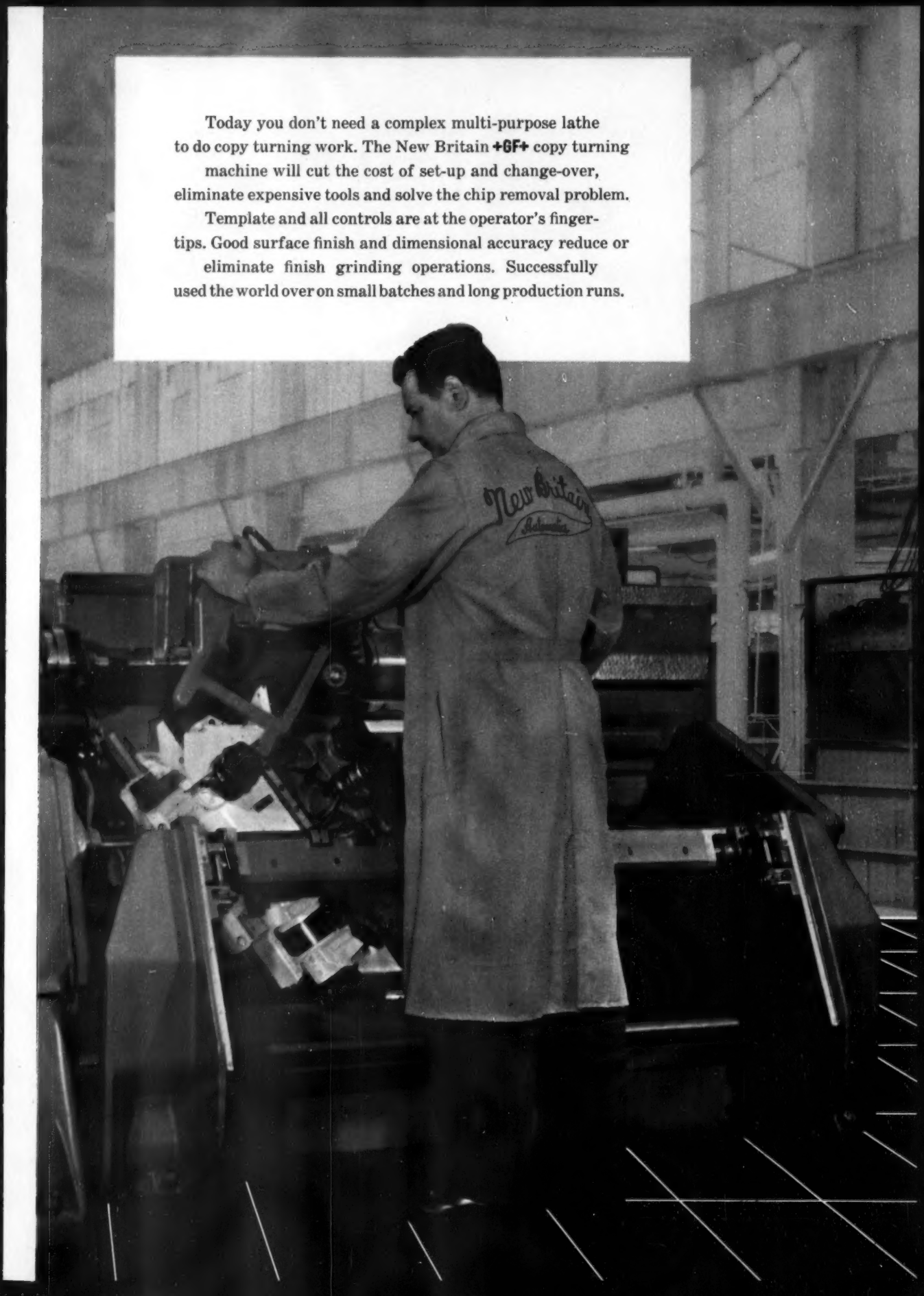
Possibly our engineers or sales representatives can help YOU achieve similar savings. You'll find them in all principal cities, ready to consult without any obligation.

NEW! Complete 88-page Manual and Catalog of Carbide Tools. Write for your free copy.

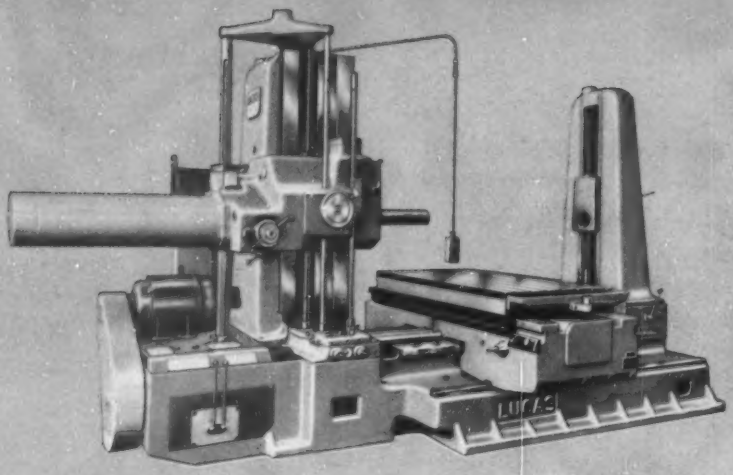
THE ATRAX COMPANY NEWINGTON 11, CONNECTICUT


You get EVERY important
improvement in EVERY Lucas
Whether your work calls for a three, four, or five inch precision horizontal boring, drilling and milling machine, you will get all the major features of any machine and some not obtainable in others when you pick a Lucas. For example:
• AUTOMATIC POWER POSITIONING • INTEGRALLY CAST 4-WAY BED • COMPLETE RANGE OF FEEDS & SPEEDS TO ONE SPINDLE • SIMPLIFIED PENDANT (TWO LEVERS DO THE WORK OF TEN BUTTONS) • VIBRATIONLESS TOOTHED BELT DRIVE TO SPINDLE AT HIGH SPEEDS • FLAME HARDENED WAYS • CHROME PLATED LEAD SCREWS
LUCAS
LUCAS OF CLEVELAND


This machine is rapidly
changing the method of doing
contour work wherever
efficient turning means money.
NEW BRITAIN
+CF+
THE NEW BRITAIN MACHINE CO.
NB



Today you don't need a complex multi-purpose lathe to do copy turning work. The New Britain +GF+ copy turning machine will cut the cost of set-up and change-over, eliminate expensive tools and solve the chip removal problem. Template and all controls are at the operator's fingertips. Good surface finish and dimensional accuracy reduce or eliminate finish grinding operations. Successfully used the world over on small batches and long production runs.

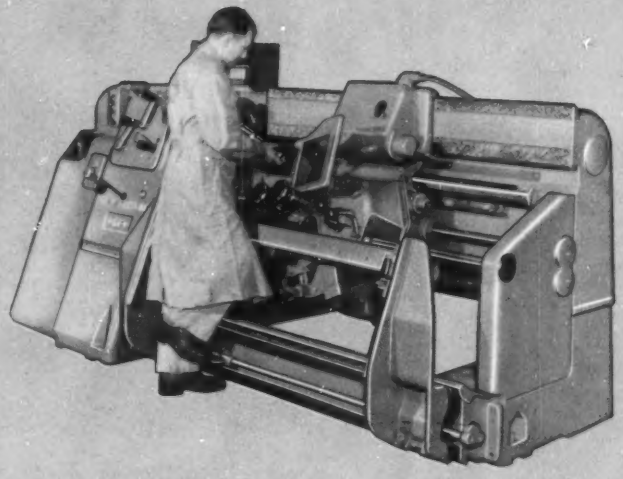


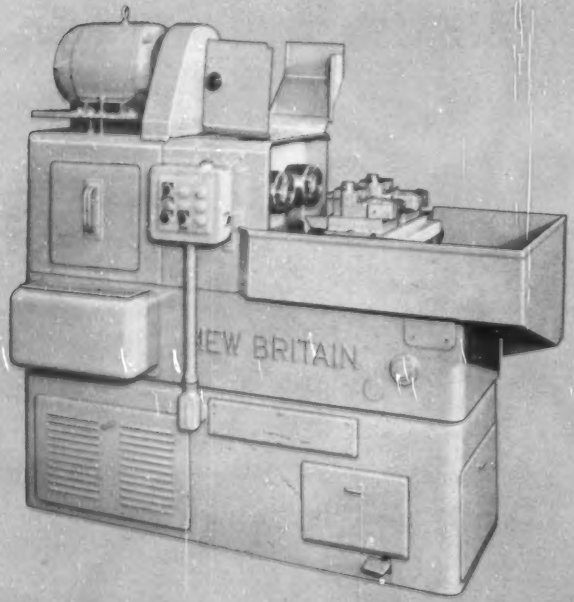
LUCAS PRECISION

A Lucas Precision Horizontal Boring, Drilling and Milling Machine will perform many operations in sequence on one piece or a thousand, from small components to large weldments. It will not only make heavy roughing cuts but will also finish to the close tolerances required in precision manufacturing. Quickly set up for short runs. Incorporates Automatic Power Positioning for multiple operation work.

NEW BRITAIN +6F+

The New Britain +6F+ copy turning machine is built on a new principle with copying saddle mounted below the spindle and on conventional lathe bed. Chips fall free and accumulate through the back of the machine. Power operated tail stock, centralized controls and front mounted prototype or template reduce operator fatigue. Powerful drive and a wide variety of speed and feed ranges make the New Britain +6F+ a profitable producer on short or long runs.





NEW BRITAIN PRECISION BORING MACHINES

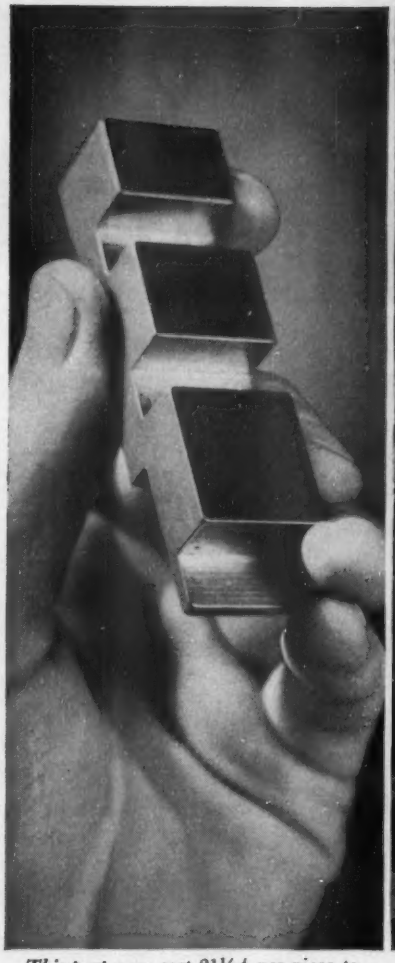
include vertical, horizontal and double end models — a complete line for both straight and contour work. New Britain's exclusive application of cam control gives your tool engineer a completely new approach to tooling, for complex pieces. Methods impossible on other types of machine can be employed to speed production, simplify tooling, eliminate finish operations and assure repetitive accuracy on a wide variety of work.

Our general catalog is filed in the Sweet's Machine Tool Catalog File.

AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES
NEW BRITAIN +6F+ COPYING LATHES

The NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio



This part once cost 21½¢ per piece to finish. The manufacturer investigated barrel finishing and decided to give it a trial.

This method — barrel finishing — proved a sensational cost cutter. The medium is Norton ALUNDUM* Tumbling Abrasive. The cost per finished part today is 5½¢!

This abrasive, a typical Norton finishing development, is sharp, dense, hard and non-fracturing. Its blocky shape eliminates slivers and chips in the process.

Cost on this piece cut 75% with barrel finishing abrasive

"TOUCH of GOLD" *enjoyed as Norton ALUNDUM Tumbling Abrasive goes to work*

This finished part tells the story in a jiffy.

Once the work entailed "hand-deburring" at a cost of 21½¢ per piece. Now barrel finishing with Norton ALUNDUM abrasive does the job and the cost is 5½¢ per piece.

Besides the savings, these other advantages were also gained: *Uniformity of radii and surface . . . Brighter color . . . Smoother finish.*

Are you taking advantage of Norton ALUNDUM tumbling abrasive in your work?

See your Norton Distributor for further facts. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in the yellow pages of your phone book. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-280

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Making better products . . . to make your products better

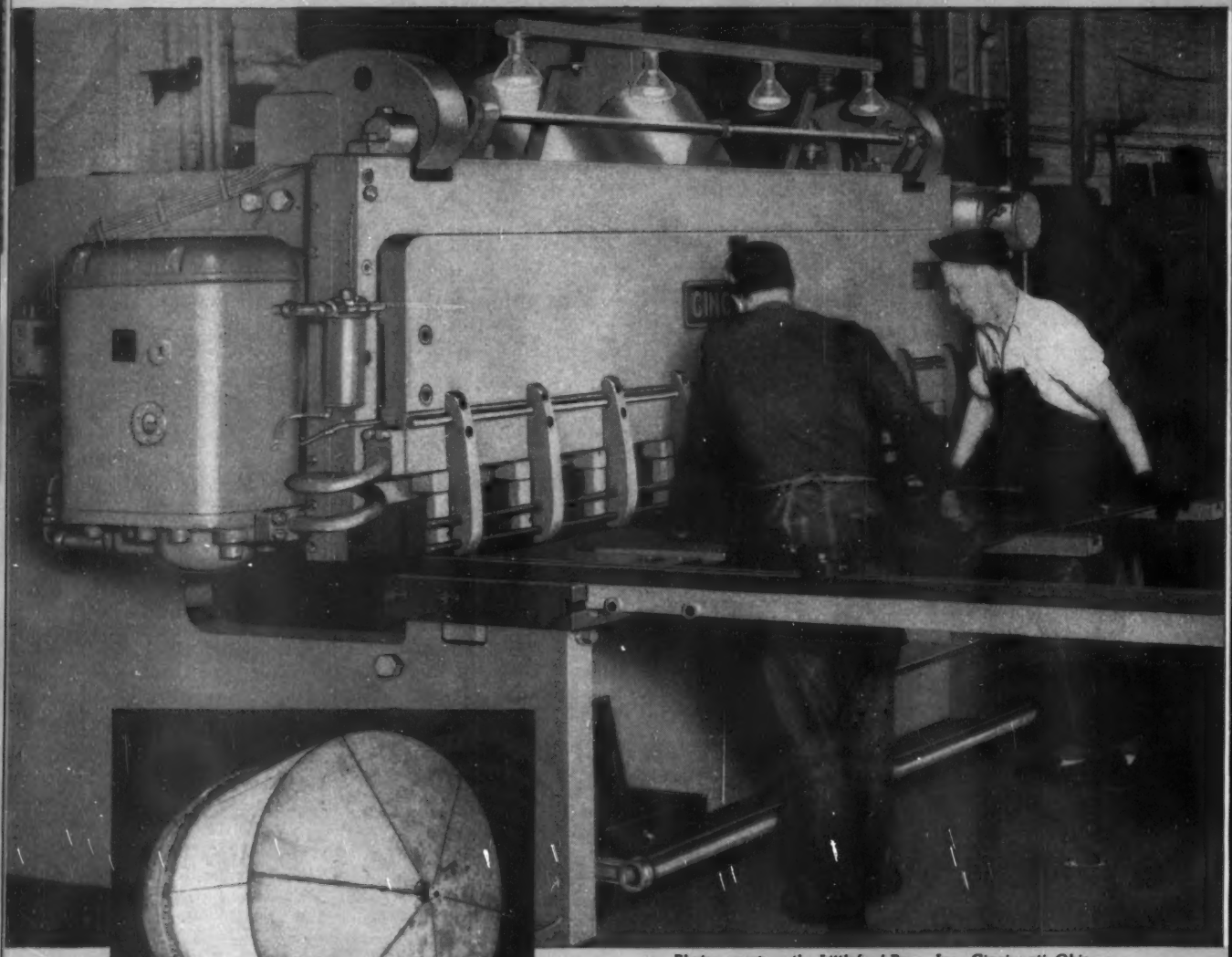
NORTON

and its BEHR-MANNING division

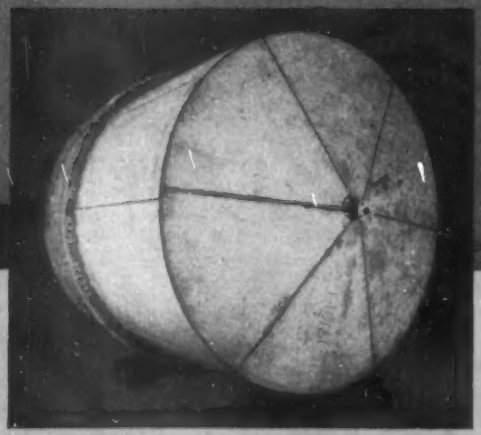
NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

They handle the job faster with

CINCINNATI

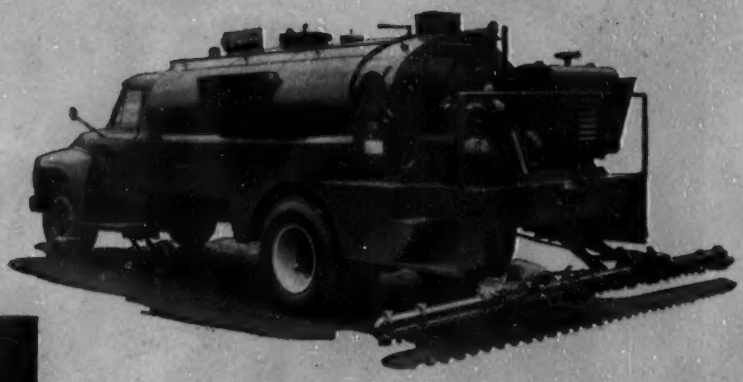


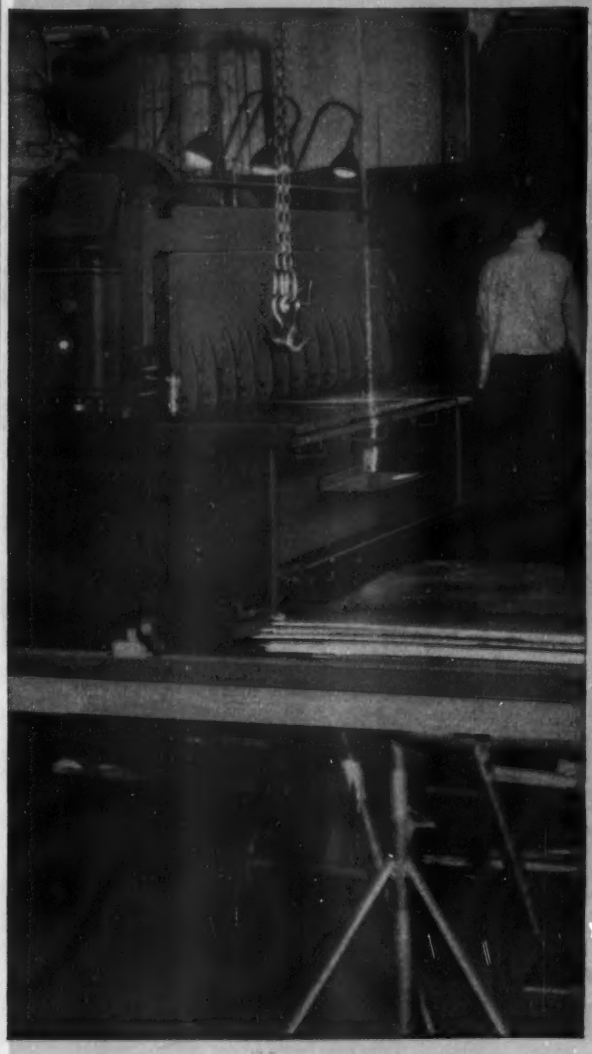
Photos courtesy the Littleford Bros., Inc., Cincinnati, Ohio.



Shearing stainless steel for tanks in the Littleford Shops.

Shears...





at LITTLEFORDS...

"Faster handling—with a high degree of accuracy", say Littleford Bros.

Simple, rapid and positive gauging, with the accurate shearing performance of these Cincinnati Shears—gives a clean cut economical production, with long knife life and low maintenance."

Write for Shear Catalog S-6.

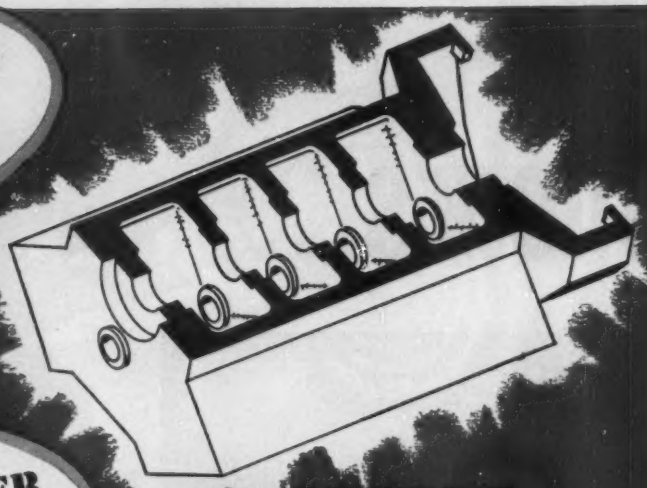
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

CUSTOMER SPECIFIED

To increase production of V-8 engine blocks, a large automotive manufacturer specified a close tolerance, production milling machine for rough and finish milling of pan rail face and bearing locks.



KEARNEY & TRECKER DESIGNED

Kearney & Trecker designed this six-spindle production milling machine as the answer. It does continuous rough and precision finish milling to .001" accuracy. Three front spindles perform rough milling. Three rear spindles handle finish milling. Close tolerances are essential because all later machining depends on this machine's accuracy. A rapid-action hydraulic locating and clamping fixture is another outstanding feature.

New production efficiency starts with Kearney & Trecker production machines

For more details on the machine illustrated ask for Data Sheet No. 1048. Free booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.

This typical example proves you can reduce costs and start on the road to higher production with machines designed and built by Kearney & Trecker's Special Machinery Division. With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has all the ingenuity and skill required to solve special machining and production problems.

Why don't you take advantage of our abilities? They can pay off in profits for you. Your Kearney & Trecker Special Machinery Division representative will be pleased to give you all details. Call him today!

Builders of Precision and Production Machine Tools Since 1898

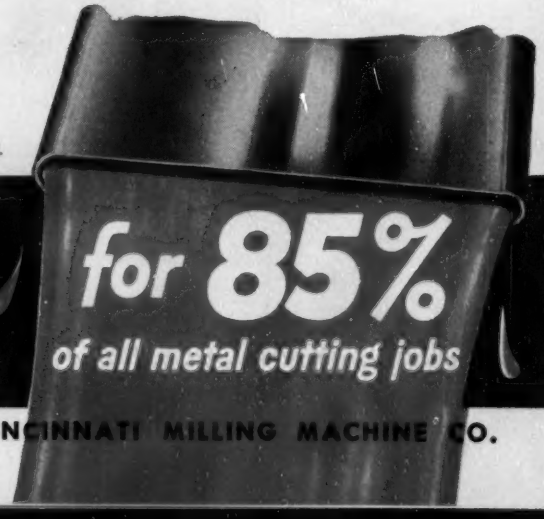
Why operators are dreaming of a ~~White~~ PINK Christmas

. . . Because pink CIMCOOL°—the radically new and different cutting fluid—is *one of the greatest working improvements in years.* It leaves no slippery film on shoes, floor, machine or work. It doesn't soil clothing or hands. It contains no skin irritants.

And look at some other reasons why machinists say *every day* is Xmas when Cimcool is on the job: Can't smoke. Can't burn. Virtually eliminates rancidity and foul odors. Cools so fast that tools and chips actually stay cool to the touch. And this revolutionary chemical emulsion *does a better job.*

So why not make their dream become *a reality* by switching to Cimcool? If you want proof that Cimcool *makes jobs better while doing a better job,* we'll be happy to provide a demonstration. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.



CIMCOOL

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Here's another reason it pays to get a proposal from Fosdick

"Lathe Bed Production Time Slashed 6 hrs."

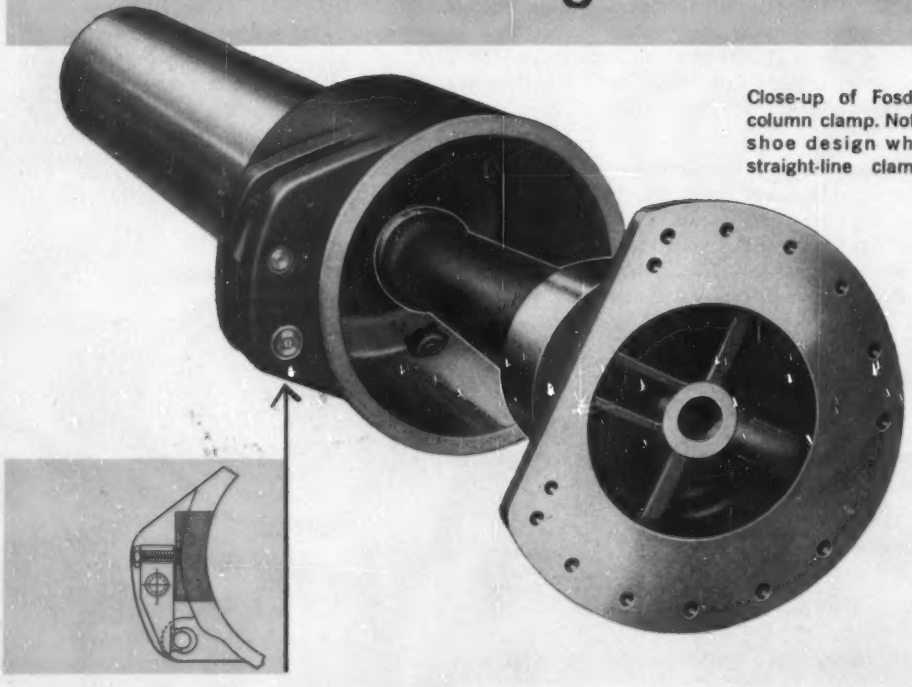
"Since installing our new FOSDICK"...

says Sidney Machine Tool Co.

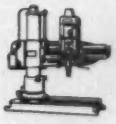
"Our new Fosdick Radial is easy to handle, requires less time for job set-ups. And its operating advantages are numerous. Formerly, we put 28 hrs. into drilling our 28' lathe bed. But with our new Fosdick Radial Drill, we've cut drilling time by 6 hours . . . saved valuable production time! We've found that it pays to get a proposal from Fosdick."

Fosdick Hydraulic Radials are available with 3' to 8' arms, 11" to 19" columns. For full information, ask for Bulletin ATA.

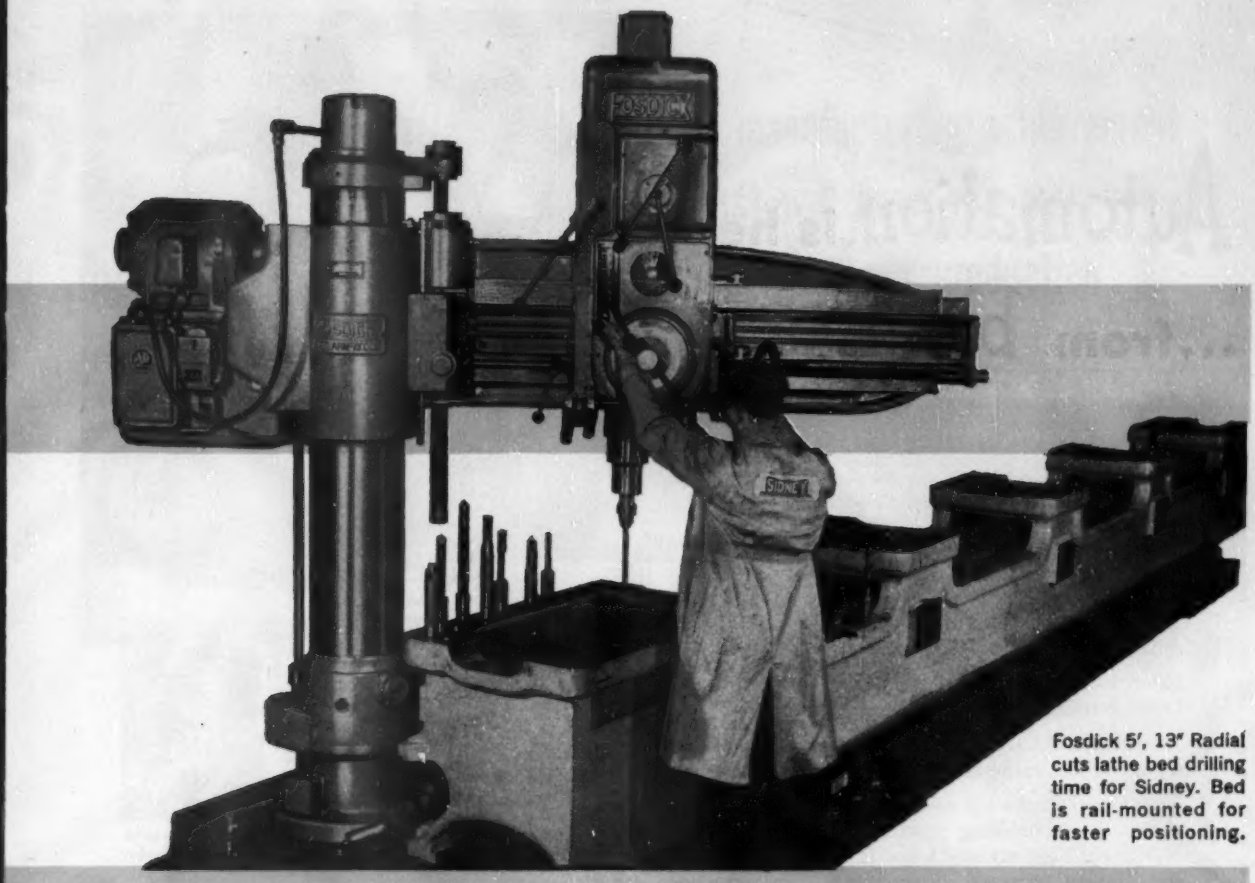
Fosdick Radials give Faster Drilling...



Close-up of Fosdick hydraulic column clamp. Note the sliding-shoe design which gives it straight-line clamping action.



Radial Drills



Fosdick 5′, 13″ Radial cuts lathe bed drilling time for Sidney. Bed is rail-mounted for faster positioning.

More Rigidity . . . Easier Handling.

Fosdick Radials give you many features that insure fast, rigid, precision drilling. To name a few:

Hydraulic Column Clamp. New sliding-shoe design gives rigid straight-line clamping action. Prevents side movement of column for sustained accuracy and speed of drilling.

Locking Control. With this feature, set-up time is reduced to a minimum. When feed mechanism is engaged, an automatic interlock clamps the head and the column. When feed is disengaged, clamping is maintained. This permits the operator to change tools without disturbing the position of the head. Clamping is disengaged by independent levers.

Tool Ejector. For speedy tool removal all the operator has to do is to move the spindle to its extreme upper position. This automatically disengages the tool. No drifts or hammers necessary.

Automatic Positioning Table. Now, available for use with radial drills! Without jigs, the Fosdick Automatic Positioner makes possible exact reproduction of precision drilled, bored, tapped and reamed parts . . . within tenths! For details write for Bulletin AT-A.

Need Drilling Equipment? Get a Proposal from Fosdick!

Jig Borers

Sensitive and Upright Drills

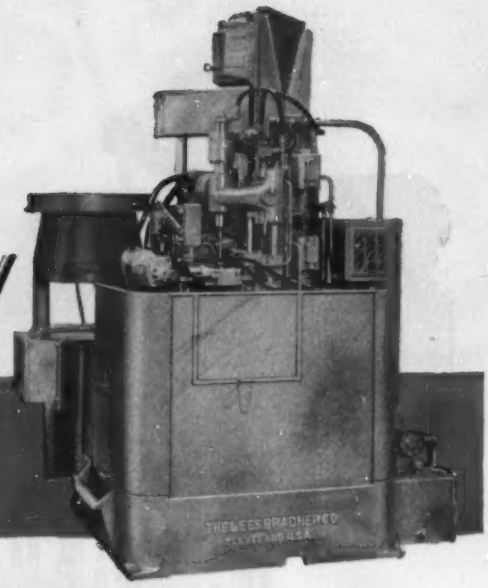
Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Automation is here ...from blank to gear!



MODEL 7-A "AUTOMATIC" SINGLE-SPINDLE HOBBER

3" diameter, single-start hob
Runs at 350 R.P.M.
Feeds at .050" per revolution
Hobs two pieces per load

Hobs one gear every 45 seconds
16 teeth in gear
Face width of gear: ⅝"
Loading and unloading time: 2 seconds

The famous Lees-Bradner 7-A single spindle hobber has now gone completely automatic!

From blank to finished gear the whole operation is "push-button". Here's how it works:

Blanks are fed from a Syntron Vibratory Feeder down a rack to an automatic pick-up arm or loader.

The loader picks up two blanks at a time and moves them to the hobbing position under an expanding mandrel. The mandrel holds the blanks while the hob moves forward automatically to commence the hobbing operation.

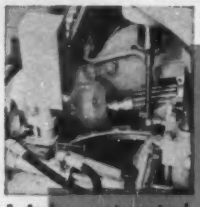
After the gears have been hobbed they are ejected by the loader as it sets the next two blanks in hobbing position.

As a control measure, the machine will not operate if:

- **The blanks are not in the loader**
- **The blanks are not removed from the arbor**
- **There is not sufficient hydraulic clamping pressure**

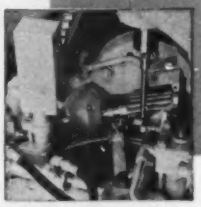
In the operation pictured the machine is hobbing a pinion gear for an automatic transmission.

Write to the company for details on this amazing new automatic hobber.



1. Arbor retracted ready for loading.

2. Loader arm moves to right with 2 blanks.



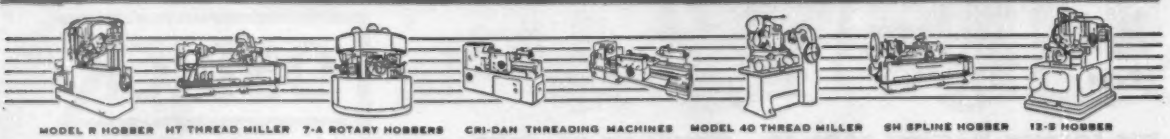
3. Loader about to eject finished gear from under mandrel.

4. Blanks held in place by mandrel ready for hobbing operation.

The Lees-Bradner 7-A Automatic Hobber is available in single units or quadruple mountings. (4 machines in line with common base, coolant tank, master control and feeder.)

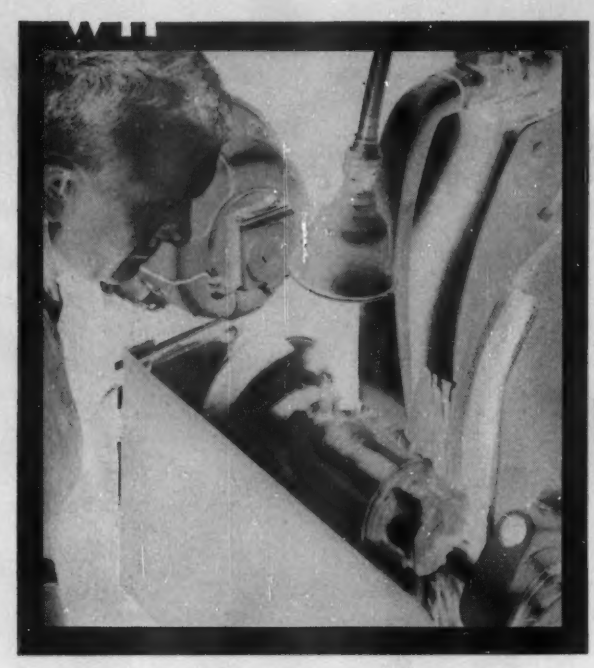
the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER



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POSITIVE DUPLICATION of an original grinding wheel every time through the CINCINNATI (PD) Manufacturing Process.

NOW!

Cincinnati Grinding Wheels offer

PD POSITIVE DUPLICATION

It's the greatest grinding wheel development in years! For through the CINCINNATI (PD) Manufacturing Process you are assured a Positive Duplication of the original wheel *every* time you reorder.

"On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will *act and grind exactly alike. Yet they are priced no higher than ordinary wheels.*

Let us prove to you how CINCINNATI (PD) WHEELS can save you money and increase your production. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio

LOOK TO THIS NEW, PRODUCTION-BOOSTING LINE

50 THROUGH 300-TON CAPACITIES

NIAGARA MACHINE & TOOL WORKS 1929 75 1954

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

For a realistic answer to the metal stamping and forming problems of today... and tomorrow

DESIGN MODERNIZATION CONCEALS DRIVING MECHANISM

Fully streamlined, enclosed construction, front and back, provides pronounced advantages. There are no exposed, overhanging flywheel, clutch, brake, intermediate shaft, nor motor in rear of press to obstruct crane service, block light, throw grease and consume floor space unnecessarily ... yet all parts are quickly accessible.

WORK-SAVING FLEXIBILITY MEETS SHIFTING PRODUCTION NEEDS

Box type welded steel slides are power adjusted through self-locking, worm driven, barrel type connections to accommodate a wide range of die heights and to permit quicker, easier and safer die setting. Niagara electric clutch control provides trouble-free push button operation and a five-position selector switch for ease, safety and efficiency in single stroking, continuous running, jogging, reverse jogging and slide adjustment.

RUGGED, HEAVY DUTY FRAMES PROLONG DIE LIFE

All-steel, rigidly constructed frames, featuring an exclusive triple box section design, provide maximum resistance to deflection from horizontal, diagonal and torsional stresses. Greater accuracy and longer die life are thereby assured.

GREAT SHUT HEIGHT AND LONG SLIDE ADJUSTMENT

Unusually liberal shut height and extremely long slide adjustment, of both one and four-piece frame construction, permit use of a tremendous range of stamping and forming dies.

Hailed as the most progressive step in straight side, double crank press history, the new Niagara SC-2 Press Series could only have originated from a keen insight of today's metal working problems and the more challenging ones of tomorrow. In every detail of design, you'll recognize the unduplicated competence of Niagara engineers. Who else would be more mindful of press users' needs than the men who design and build America's leading and most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work?

CHECK THE FEATURE-BY-FEATURE EVIDENCE

Preview this complete new line of straight side presses at once. Find out what they can do for you. Write for Niagara's new, illustrated Bulletin 64-H today.

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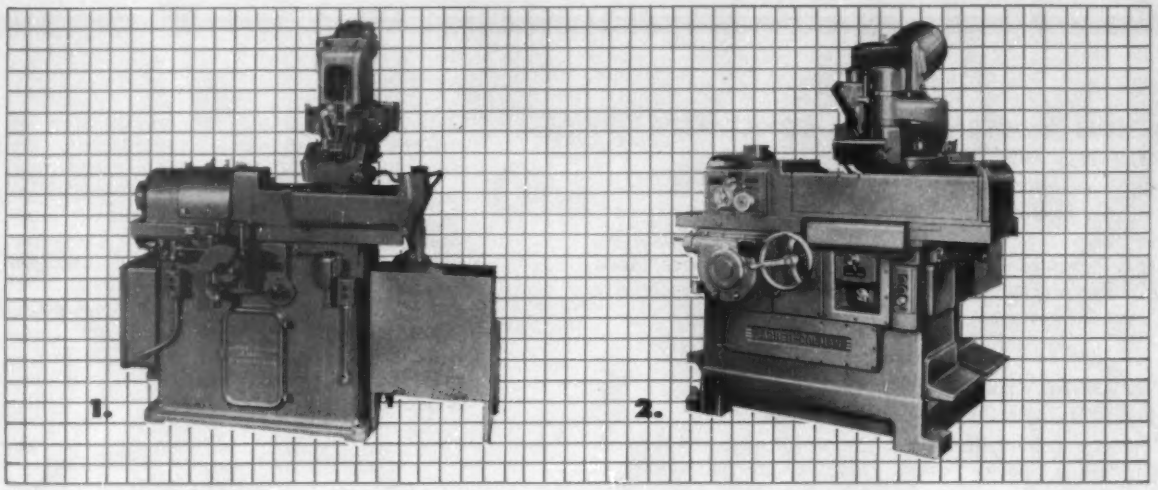
NIAGARA

STRAIGHT SIDE DOUBLE CRANK PRESSES

AUTOMATIC HOB SHARPENING / the efficient way



Barber-Colman Sharpening Applicable to All Hobs and Form-Relieved Cutters

Sharpening is the one element of hob accuracy which the user must maintain. For high production sharpening or for small, job-lot sharpening, the most economical and most accurate method is the Barber-Colman method. Three machines cover the size range of your work and the price range for your specific requirements. One of these three automatic machines, the No. 4-4, No. 6-5 or No. 10-12, will do your job cheaper, faster and more accurately than can be done by any other method.

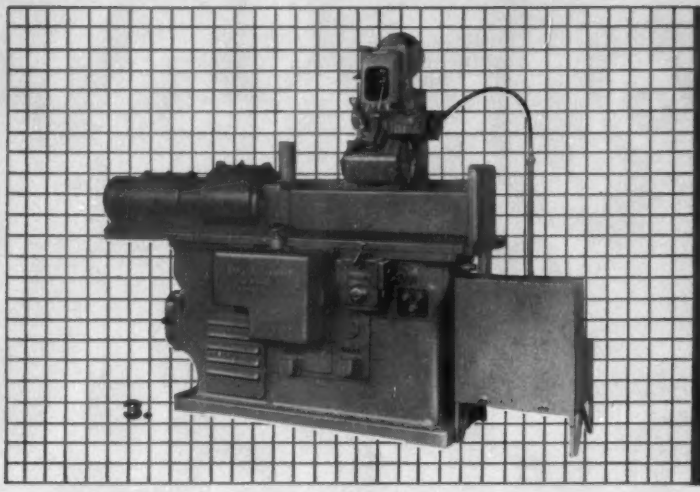
Keep Tool Maintenance On A Production Basis

Positive mechanical control over all sharpening factors takes the human element out of resharpening hobs and formed cutters. It is the efficient way to sharpen these tools because it puts sharpening on a production basis and automatically produces uniformity, reduces sharpening time, and saves the operator's time for other duties. Spacing, lead of gash and radialism are held within the tolerances for any accuracy classification, including Class AA. Any hob or formed cutter can be sharpened on one of these automatic sharpening machines.

All Barber-Colman hobs and form-relieved cutters are sharpened on these machines. Because of their accuracy and ease of operation, these machines are also used by most competitive hob manufacturers for sharpening their hobs. Tolerances for the specific class of hob are easily held, and one operator can operate several machines. Once the necessary set-up is made, sharpening proceeds automatically without further attention from the operator.

BUILDERS OF PRECISION GEAR

TO MAINTAIN HOBS AND PROLONG CUTTING LIFE



1. No. 4-4 Automatic Sharpening Machine. High Production, Fixed Stroke. Work 4" Diameter, 4" Length. Wet Grinding Optional (Shown).

2. No. 6-5 Automatic Sharpening Machine. Adjustable Table Stroke for Maximum Production. Wet Grinding Standard. Work 6" Diameter, 5" Length.

3. No. 10-12 Automatic Sharpening Machine. Adjustable Table Stroke for Maximum Production. Large Work up to 10" Diameter, 12" Length. Wet Grinding Optional.

New Features Step-Up Sharpening Production, Versatility and Convenience

With costs a vital factor in maintaining competitive position, many new features and improvements in Barber-Colman Automatic Sharpening machines will help you place man-hours and tool costs on a competitive basis.

Wet grinding is an ideal arrangement for sharpening carbide tools, and also permits higher sharpening feeds on high-speed steel tools. It is optional on No. 4-4 and No. 10-12 machines, but is standard equipment on the No. 6-5 Sharpener.

Adjustable stroke increases convenience and sharpening speed. This is a standard feature on both the No. 6-5 and No. 10-12 machines. New wheel spindle, work spindle and tail center designs have been incorporated in all machines for increased accuracy, convenience and output.

Check these new features for sharpening efficiency on your production operations and cost-reduction in tool programs. For full details on the complete line of Automatic Sharpening Machines, see your Barber-Colman representative or write direct to Automatic Hob Sharpening.

Complete data on cause and effect of hob sharpening errors, as well as detection and correction of such errors is contained in this recent issue of Hobbing Notes. Write for Vol. XI, No. 1 on your company letterhead and we will mail you a copy promptly.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 6112 ROCK STREET, ROCKFORD, ILL.

HOBS AND MACHINES SINCE 1911

Cut Costs and
Increase Efficiency with

HELLER

LONG BED MILLING MACHINES

HELLER
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114 LIBERTY STREET,
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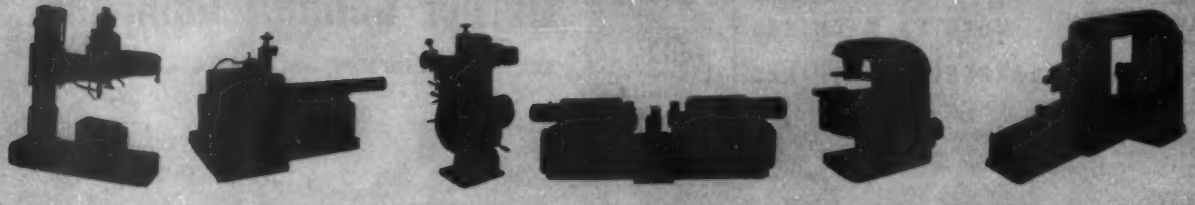
KNEE & PLANER TYPE MILLING MACHINES
COLD SAWING MACHINES • SAW SHARPENING MACHINES • SAW BLADES • TRANSFER MACHINES • SPECIAL MACHINES

Builders of medium and heavy Long Bed Milling Machines with independently controlled milling carriages through electro-hydraulic operation.

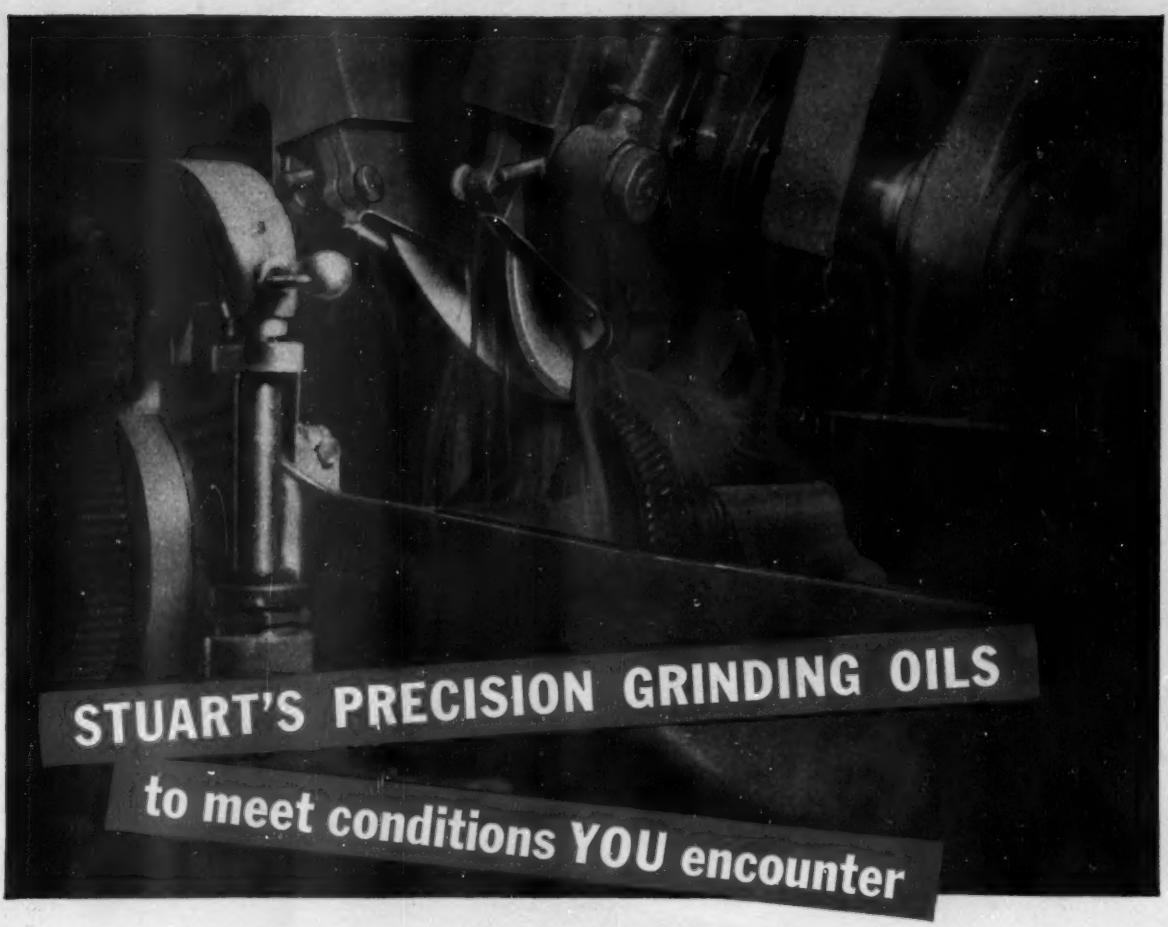
Illustration shows machine specially designed for milling rotor slots and for work on heavy frames, bonnets, and large miscellaneous types of castings.

Available in smaller machines from 15 HP rated carriages up to 400 HP milling carriages.

Importing Heller Machines Since 1926



DRILLING MACHINES | COLD SAWING MACHINES | SAW SHARPENING MACHINES | TRANSFER AND SPECIAL MACHINES | KNEE TYPE MILLING MACHINES | PLANER TYPE MILLING MACHINES



IF your grinding operation requires a straight oil there is a Stuart grinding oil that has been developed to meet the various conditions and problems *you* encounter. When using the *right* Stuart grinding oil for the job you can expect better wheel form and longer wheel life, better surface finish and closer tolerance control . . . all a necessity with today's demand for finer workmanship and engineering skill.

There are three types of grinding oils . . . hard, medium and soft. All are good on certain jobs but none are good for all jobs. "The Man in the Barrel," your Stuart Representative, will be happy to help select the proper grinding oil for your particular needs. Fill out the coupon below today . . . and be sure to ask to have "the Man in the Barrel" call.

HARD ACTING GRINDING OILS

. . . for grinding soft, tough, stringy materials such as stainless steels, monel metal and high temperature alloys. Also indicated where wheels of small diameter are employed such as internal grinding operations.

MEDIUM ACTING GRINDING OILS

. . . for use on the wide range of average work. They are fluids that have had both hard and soft acting qualities scientifically balanced to provide a very satisfactory performance, except under extreme conditions.

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More than a "Coolant" is Needed

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NEW

JONES & LAMSON

MODEL FC-30 OPTICAL COMPARATOR

with Electronic, Variable Speed Vertical Measuring Control

Easy, close access to 30″, eye level screen
New brilliant surface illuminator

Thirty-five years' experience in developing optical comparators—16 years' experience with 30″ viewing screens—has gone into making this ultra-modern precision inspection machine.

Built to highest machine tool standards, its wholly integrated design allows the operator to view the entire screen at close range while making quick, accurate measurements.

Electronic, variable speed vertical measuring control allows the work piece to be raised or lowered, slowly or rapidly to the exact measuring point desired. Imagine — quick, precise measurements to .0001″, in one motion, with fingertip pressure.

The FC-30 also has these additional *exclusive features:* 5″ and 8″ diameter capacity with easy change-over; 6″ projection lens optional; carbide tipped micrometers graduated for direct reading in either direction, combined with micrometer zeroing anvil; measuring dial illuminators.

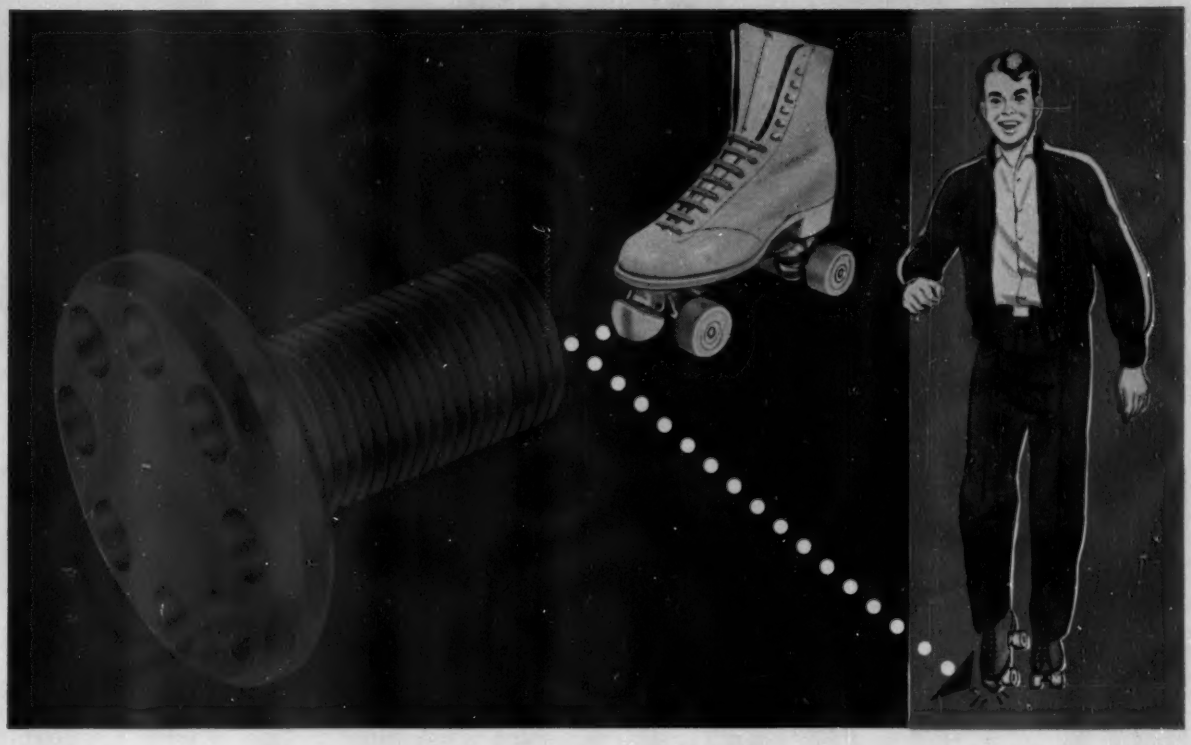
Available for immediate delivery.

P.S. *Write today for folder containing complete information.*

JONES & LAMSON

World's largest manufacturer of Optical Comparators since 1919

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L **OPTICAL COMPARATOR DIV.**



REYNOLDS ALUMINUM SCREW MACHINE STOCK

gives roller skate toe stop strength without weight

The screw machine part above is made by Ware Brothers Division of Chicago Roller Skate Company . . . manufacturers of quality skates for professional and amateur use. This toe stop takes plenty of punishment but aluminum screw machine stock from Reynolds offers ample strength and mass . . . yet is light in weight—the perfect combination for this part.

The manufacturer says, "We are currently blanking and threading this toe stop part of Reynolds 2011-T3 aluminum rod on automatic screw machines and drilling the holes on drill presses. As production increases all operations will be performed on the automatic screw machines. We also use a forged aluminum foot plate in this skate."

Consider the many advantages of aluminum screw machine stock from Reynolds. Job for job, aluminum alloys machine at greater speeds and feeds. This means a step up in production. And your unit costs for material, handling and shipping step down because strong, lightweight aluminum gives you *three times the number of pieces per pound.*

For assistance on correct alloy selection and prompt delivery on aluminum screw machine stock plus design and fabrication engineering service, call your nearby Reynolds office or distributor listed under "Aluminum" in your classified telephone directory. Write on business letterhead for your free copy of the 124-page handbook "Machining Aluminum Alloys", and an index of other Reynolds literature. *Reynolds Metals Company, 2523 South Third Street, Louisville 1, Kentucky.*

Quotation Accepted
You can increase your sales and save your customers money if you submit alternate quotations based on aluminum when other materials are specified.

See "Mr. Peepers", starring Wally Cox, Sundays on NBC-TV

REYNOLDS ALUMINUM

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Mapes & Sprowl Steel Co., *Union

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On the job...but not on the payroll. That's the way we would like you to think of our warehouse services. Whenever we can, we will give you the help you need on production problems, backed by Reynolds technical service men in the field and the fully integrated staff at Reynolds home office. Let us show you how our services can solve some of your problems, and, at the same time, save you money.

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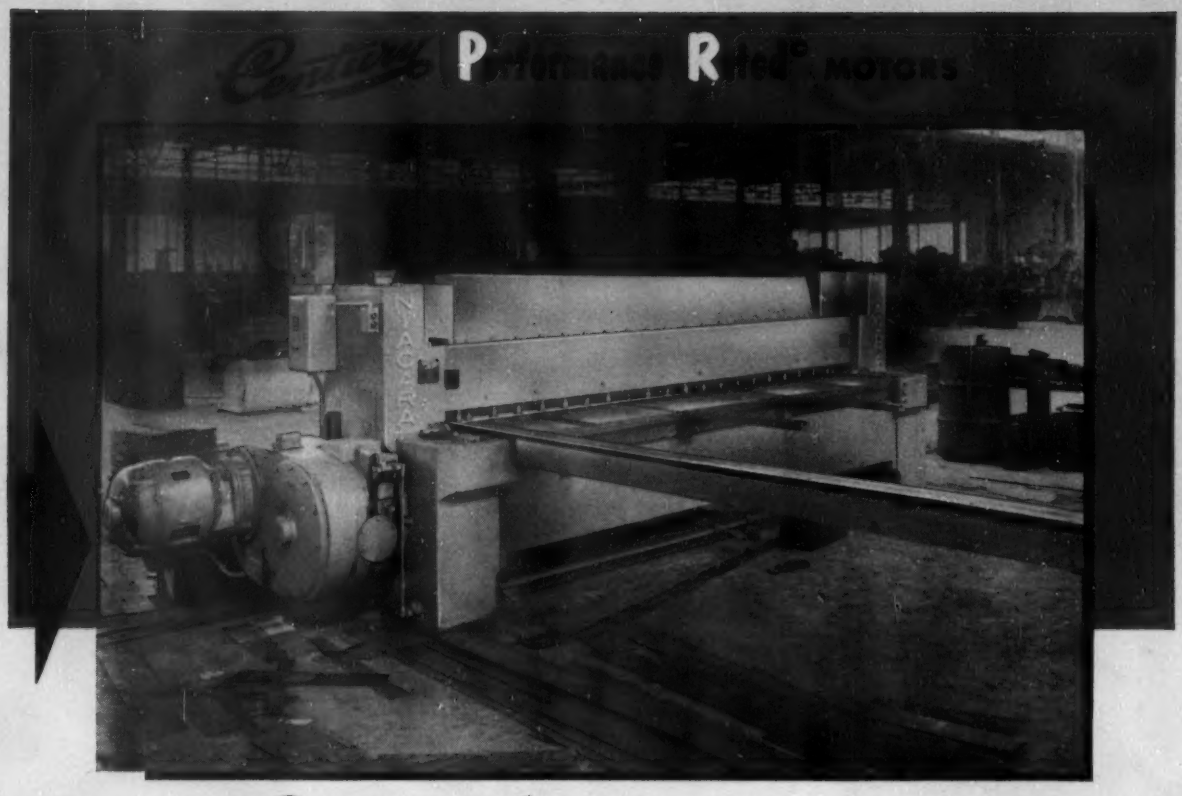
REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND



Century JOB MATCHED MOTOR...

PROVIDES THE HEAVY DUTY MUSCLE POWER

FOR THIS LARGE SHEAR

The Century Motor was selected with the proper torque and speed for this shock load—adaptable mounting—drip proof frame—all the factors to functionally match this specific application.

The rugged construction details of the motor are Performance Rated to match the heavy duty stamina built into the shear.

Century Performance Rating is available to you because of the wide range of specifications from which to select. Motors are offered in A. C. or D. C.—⅛ to 400 H.P.—Constant speed or speed control in fine steps.

SPECIFY Century *Performance Rated* MOTORS for your equipment. Call a Century District Sales Office or your nearest Century Authorized Distributor.

Century C MOTORS

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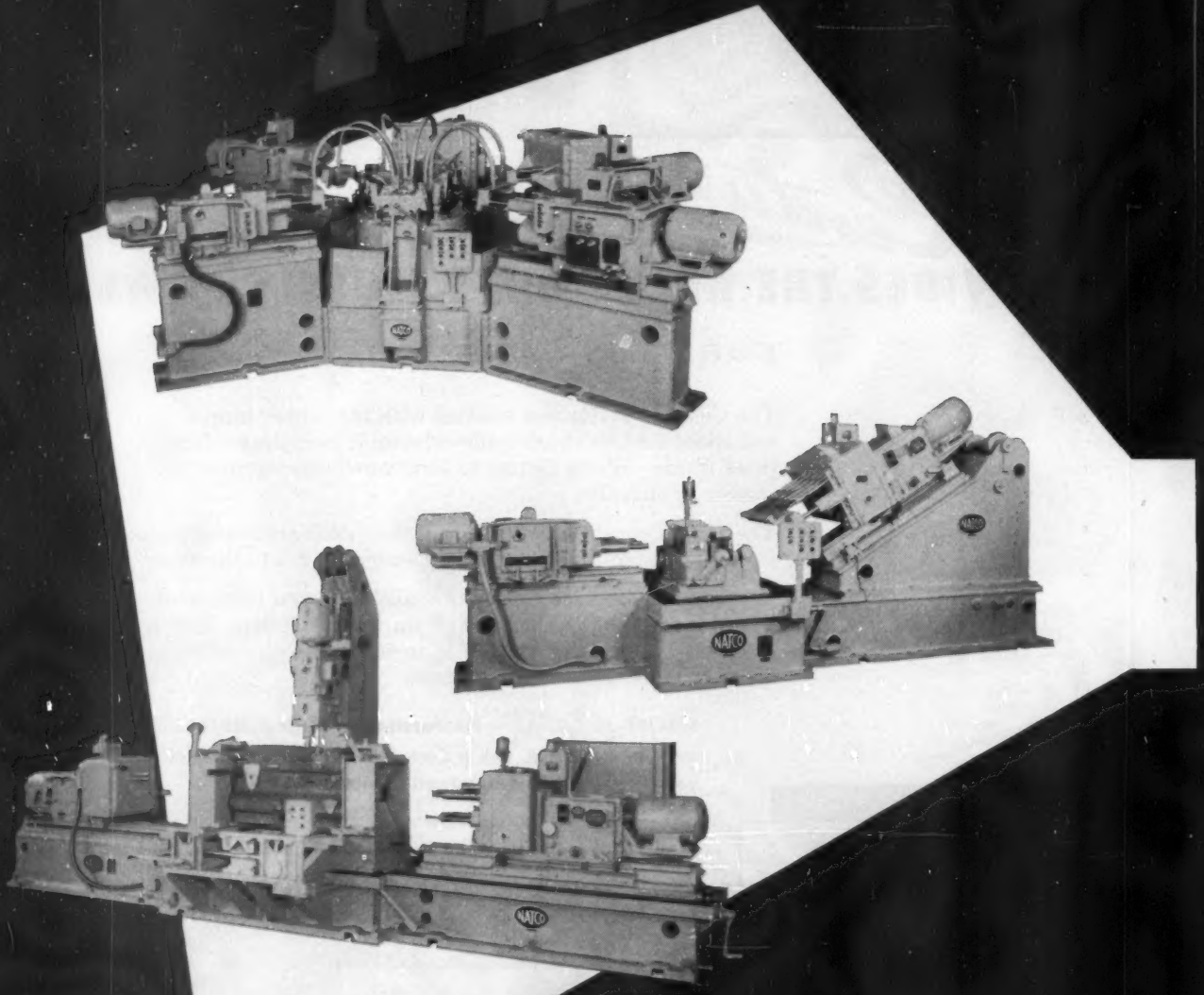
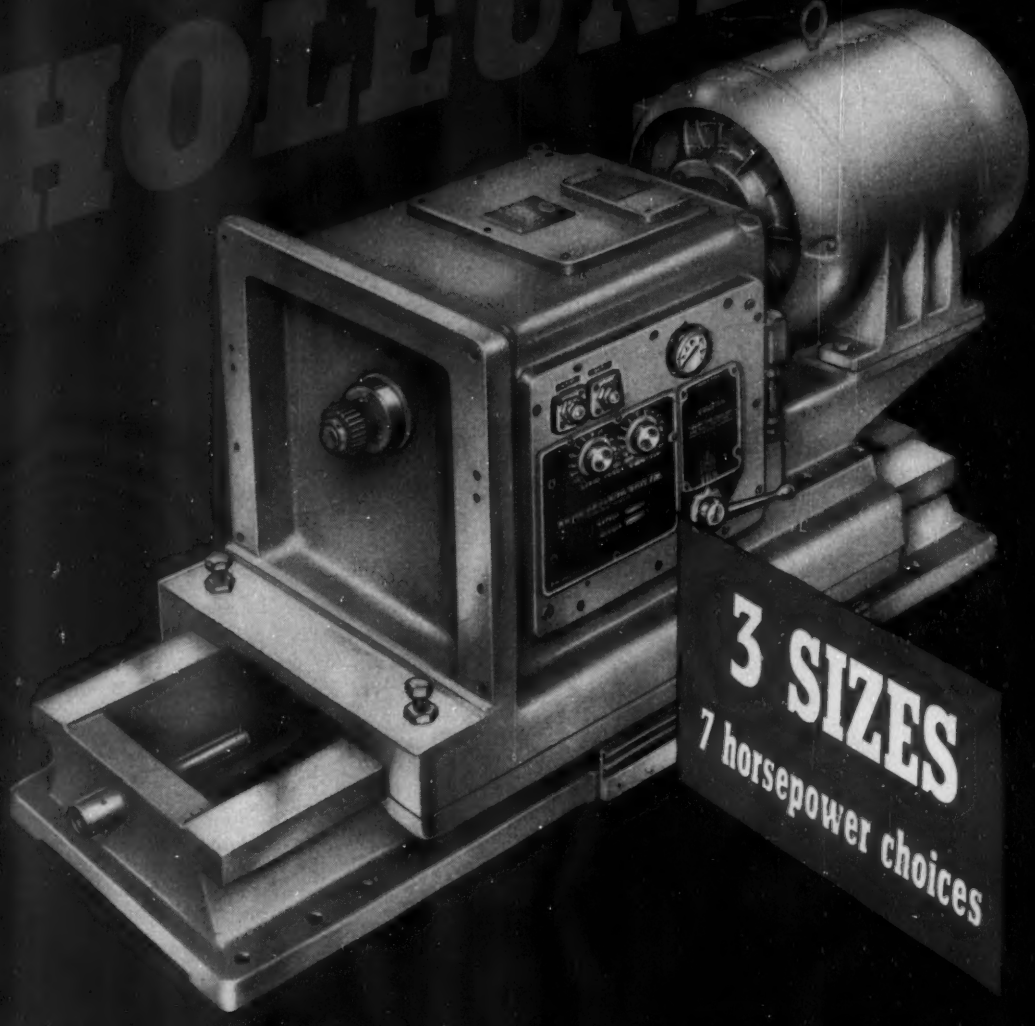
BUILD YOUR OWN DRILLING, BORING, FACING and TAPPING MACHINES WITH...

NATCO



HOLEUNITS



Shown at left are a few representative machines that have been built from NATCO Holeunits. These standard, compact, self-contained hydraulic units are furnished in three sizes and may be arranged with any one of seven different horsepower capacities ranging from one and one-half to fifteen horsepower. They will operate at any angle and no connections other than electrical are required.

Call a Natco Field Engineer

to help you solve your problems in
Drilling, Boring, Facing and Tapping

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

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another
Columbia
press brake feature

specially designed air clutch and brake

Self-adjusting clutch, installed in heavy, balanced flywheel, cushions shock, assures long, trouble-free service. Multiple spring-loaded brake stops ram automatically when clutch is disengaged.

jogging or one stroke ...it's trouble-free

Columbia "New Series" Power Press Brakes incorporate years of experience in the heavy metal working field with time, labor and cost-saving features of the most advanced design.

Typical are the air clutch and spring brake, particularly designed for press brake service. The smooth operating, positive clutch is installed in a heavy, balanced flywheel. Drive to the gearing is by a heavy alloy steel shaft.

When the clutch is disengaged, the disc type friction brake is automatically applied, holding the ram in any position without creeping. The air clutch and brake are available on series 180 and larger size Columbia press brakes.

Among other Columbia advanced design features are the exclusive wedge-type ram pressure release and the motor-operated micrometer ram adjustment. For dependable performance, check the many production-proved features of rugged Columbia Press Brakes.

Get the complete story on exclusive Columbia press brake features. Write for new FREE Bulletin No. PB-1 and the name of your nearest distributor.

Columbia Power Press Brake, Model 180-12. Capacity, 12' x ¼".

COLUMBIA DIVISION THE Lodge & Shipley CO HAMILTON 2, OHIO

UNPARALLELED GRIP *from parallel jaws*

Latest And Greatest In Collet Design! Tool engineers and machine tool builders praise the Jacobs Rubber-Flex Collet as one of the outstanding developments in modern tool history. This new principle of collet construction brings you not only great improvements in gripping power, accuracy, and service life, but — *for the first time* — a collet with a full ⅛ inch capacity range.

The Jacobs Manufacturing Company, West Hartford 10, Conn.

IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

. . . first in service

ARMSTRONG
TOOL HOLDERS...
for every operation!

There are ARMSTRONG TOOL Holders in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. Armstrong Ave. Chicago 30, Ill.

HEAT TREATING BOOSTS PRODUCT PREFERENCE

Sales Up 300%

...increase credited to ALLIS-CHALMERS INDUCTION HEATING

JAMBOR Tool & Stamping Co.
Milwaukee 10, Wisconsin, U. S. A.
BULL DOG AUTOMOTIVE PRODUCTS

Allis-Chalmers Mfg. Co.
Box 501
Milwaukee 1, Wisconsin

Attention: Mr. Ottmar W. Noeske,
Induction Heating Section

Gentlemen:

For eighteen years we used a special low carbon steel in our king bolts. The great wearing qualities of this steel make heat treating unnecessary. However, even though it will outlast any treated steel, it is file soft.

Naturally, our competitors made an issue of this fact.

To remedy the situation we decided to use a higher carbon content steel and treat our king bolts with the most advanced equipment on the market -- an Allis-Chalmers Electronic Induction Heater.

Since this heater's installation eight months ago, increased preference for our king bolts has been amazing. Sales are up 300%!
In addition, we've cut material costs by 10%.

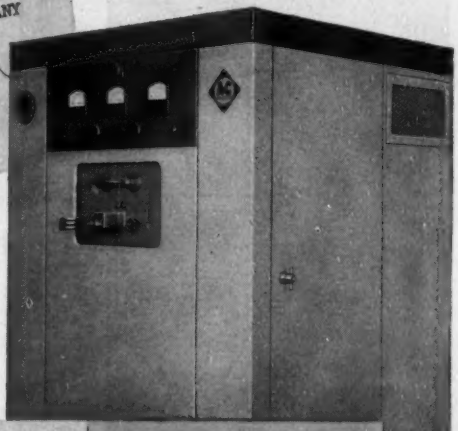
We know this is the type of success story you like to hear and, of course, we're happy to be able to say it happened to us.

Yours truly,

JAMBOR TOOL & STAMPING COMPANY

E. L. Pressinger,
Vice president

ELP:cz



Jambor reports selective control of hardening and penetration with their 20-kw Allis-Chalmers heater. White line indicates hardened steel. Black area around it is merely plastic wrapping to increase visibility of etched surface.

If your production involves hardening, soldering, annealing, brazing and/or heating — find out about Allis-Chalmers induction heating. See how you can increase preference for your products, boost output, decrease costs and cut rejects.

Get productive flexibility, too. Setting up these heaters to handle various jobs is merely a matter of changing a single coil. You can handle small, odd-lot work with almost as much efficiency as long production runs.

For all the facts, contact your nearest A-C District Office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4501

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Get **more parts** per hour

Look how MX has increased production and increased tool life on these typical screw machine parts

part	stock size	machine	operations	comparative performance				
				grade	SFM	seconds per part	production increase	tool life increase
DRUM NUT	⅝" round	Acme Gridley	drill rough form turn break down tap finish form cut off	B-1113	285	3.17	....	....
				MX	345	2.86	11%	87%
SHAFT	¼" round	Brown & Sharpe #00	rough form finish form ream turn cut off	B-1113	255	7.0	....	....
				MX	277	4.5	55.6%	30%
WASHER	¾" round	Brown & Sharpe	drill ream cut off	B-1113	172	14.2	....	....
				MX	250	10.0	42.5%	100%
	1⅜" round	Brown & Sharpe G-2	center drill recess, drill tap thread form face cut off	B-1113	245	35	....	....
				MX	312	27.5	27%	25%

and longer tool life ...do the job with MX

the freer-machining screw stock
available in both Bessemer and Open Hearth

Make a note of this: USS Free-Machining MX Steels *have been successfully machined at speeds approaching 350 SFM.*

A broad appraisal of all screw machine operations shows that the *average* speeds used are under 250 SFM and that only a small percentage of parts are machined at speeds in excess of 300 SFM.

So unless you are operating at the highest speeds—and comparatively few shops are—you simply don't need and can't take advantage of any greater machinability than MX offers.

Remember that USS Free-Machining MX is designed to ensure *maximum* cutting speeds compatible with *economical* tool life. And it does. Wherever fast-cutting MX is put to work, production goes up and costs come down. From results obtained in shops that have used MX in more than a billion parts of many different kinds, we feel sure that MX will cut the cost of *any* part you now machine from ordinary screw stock. It does this in four ways.

By increasing the rate of production, *MX lowers the cost per part.* By prolonging tool life, *MX reduces down time.* By assuring better part finish, *MX often eliminates extra finishing operations.* By providing closer dimensional accuracy, *MX helps to minimize rejections.* In short, USS Free-Machining MX offers you greater economy and greater efficiency in your machining operations.

In view of these facts we suggest that you carefully review your screw machine operations. If you normally operate at speeds lower than 350 SFM, your best bet is USS MX, either Bessemer or Open Hearth. You'll be money ahead – get more parts per hour, longer tool life and better parts—if you use MX, which you can buy at the *same* price you pay for comparable grades.

USS Free-Machining MX is produced in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier either as "MX" or under his own identifying trade name. In hot-rolled form MX is available through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

UNITED STATES STEEL

here's a "hole" lot of versatility...

Lodge & Shipley OIL COUNTRY LATHES

The Lodge & Shipley Oil Country or Hollow Spindle Lathe is like two lathes in one. Very long pieces . . . far longer than the normal center-to-center distance . . . can be chucked right through the large hole in the spindle. You save capital investment and floor space too! Add a headstock collet and center and you can do all normal between-center work.

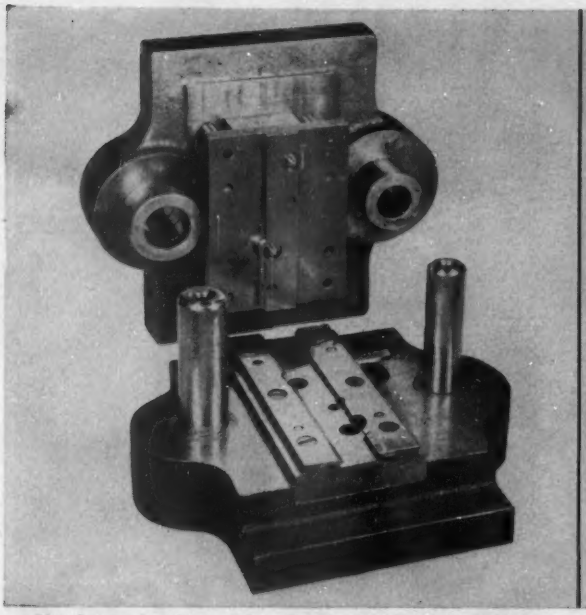
The two-speed drilling tailstock makes drilling easy . . . you can feed even a 6-inch drill into solid steel stock.

The leadscrew is reversible, end-for-end. This unique Lodge & Shipley feature doubles leadscrew life.

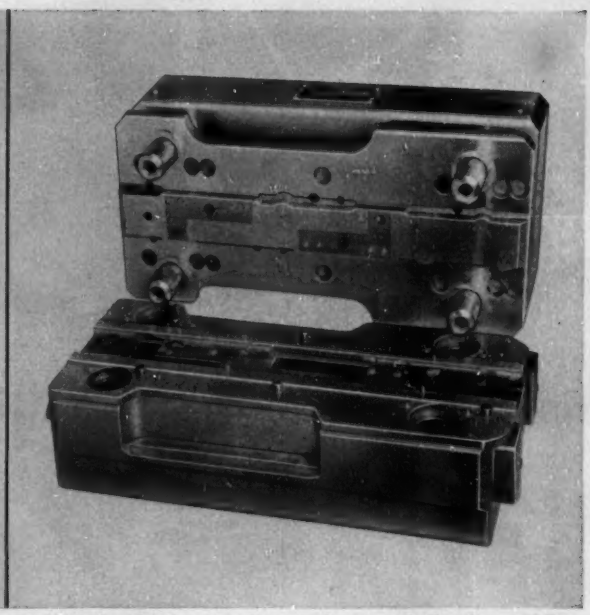
If you want extreme versatility . . . versatility that has made this lathe as popular in the maintenance, repair and production departments as in the oil fields . . . you want the Lodge & Shipley Oil Country Lathe. Write for detailed literature: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio

Lodge & Shipley

....your **LODGE**-*ical choice!*



Simple progressive washer die, used at Precision Spring Company, Detroit, Michigan, pierces and blanks spring-tempered steel washers. With millions of accurate hits per sharpening, this die builds profits by cutting costs.



Complex lamination die punches two high-silicon "L" laminations per stroke. Dies of this type are in use throughout the metal-working industry, outwearing and outproducing steel dies by up to fifty times.

Dies equipped with CARBOLOY® CEMENTED CARBIDE increase production from 10 to 50 times

Over a wide range of applications, Carboloy cemented carbides have proved their superiority to steel by increasing production and cutting costs.

Here are some of the actual results achieved when users of large and small, simple and complex dies, switched from steel dies to dies equipped with Carboloy cemented carbide:

Lamination die. With Carboloy cemented carbide, production runs averaged 35 times longer than possible with steel.

Pierce and cutoff die. At 400 strokes per minute, carbide-equipped dies produced 2,000,000 strokes without resharpening.

Blanking and drawing die. Carbide-equipped die lasted months before resharpening. Steel required maintenance every week.

Deep drawing die. With Carboloy cemented carbide, manufacturing time per 100,000 pieces was slashed from 70 hours to 52 hours.

Explore the possibilities of using Carboloy cemented carbides in your dies. Carboloy engineers will give you or your die-maker every possible assistance. And, you can have your key men trained at the Carboloy Die School in Detroit.

Carbides are simple to use, easy to maintain. They'll pay for themselves through increased production, fewer rejects, reduced downtime and higher quality.

For complete information or for free Carboloy Die Engineering Manual, send coupon, today.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
Department of General Electric Company
11149 E. 8 Mile Street., Detroit 32, Michigan

- ☐ Rush me free Carboloy Die Engineering Manual D-124.
- ☐ Send complete details on free Carboloy Die Training School.
- ☐ Have a representative of the Carboloy Engineering Appraisal Service call at my plant, at no obligation to me.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Grinding slitting knives to within .0001". Air gage permits on-the-job size control.

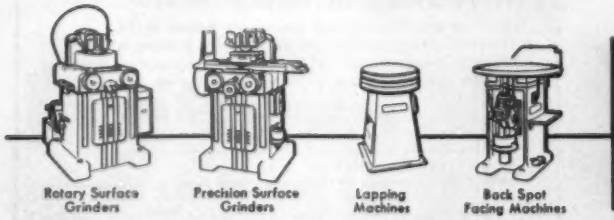
THIS 6" ROTARY GRINDER Grinds To .0001"

Taft-Peirce Designed It To Speed and Simplify Precision Grinding

Hard to believe but true — this Taft-Peirce 6" Rotary Surface Grinder makes grinding to .0001" an amazingly simple job. Exceptionally accurate, sturdy, vibrationless. An exclusive vernier feed permits precise vertical settings of .0001" instantly . . . exactly. Takes the guesswork out of finish grinding. Gives you flatter, finer surfaces.

And here are two more important features. A simple adjustment tilts the wheelhead up to 30 degrees in the vertical plane. The work spindle and superpower magnetic chuck tilt 7½ degrees forward or backward. This chuck holds even very small workpieces firmly and dependably in the center of the faceplate.

Operators report undiminished accuracy over unusually long periods, sharply reduced wheel-wear, and negligible maintenance. Ask for the Taft-Peirce 6" Rotary Grinder Bulletin for more information.

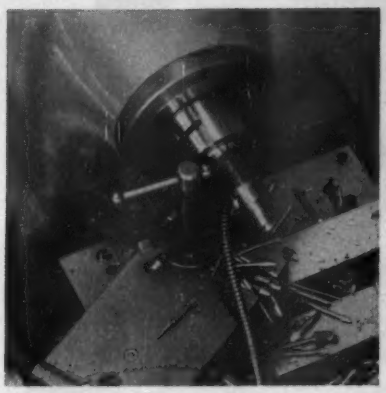


T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

HARDINGE
ELMIRA, N.Y.

"The Outstanding Tool Room Lathe"



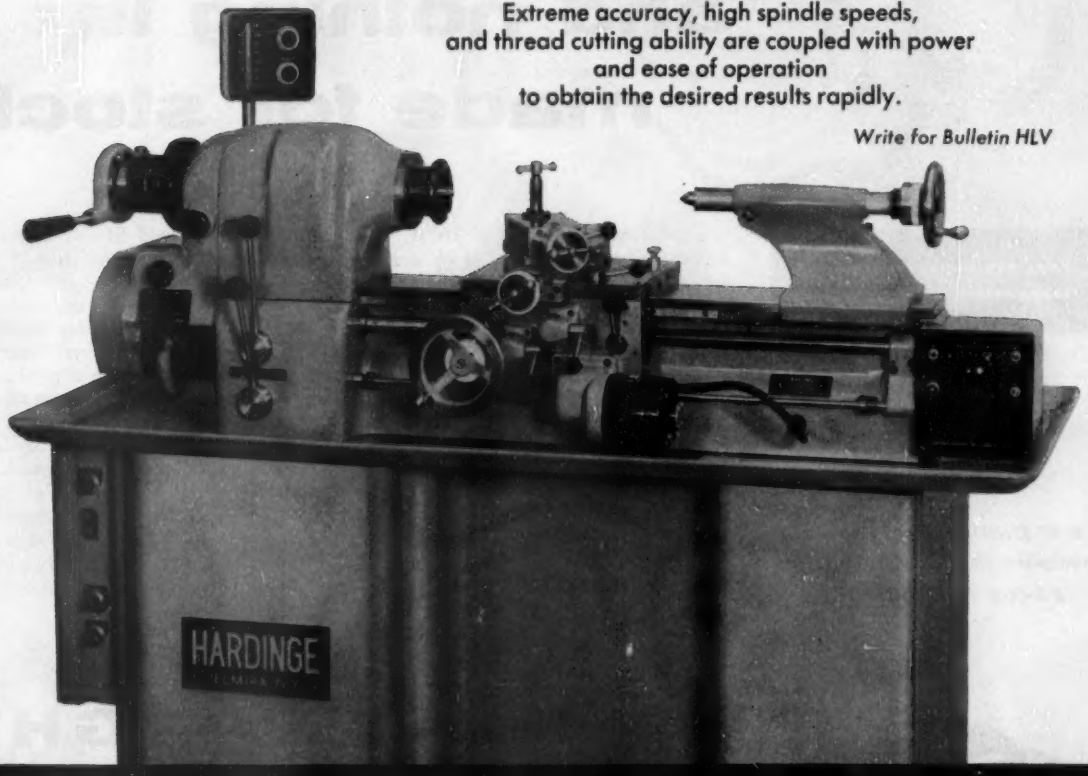
Precision Collet work for all sizes to 1/16" Collet seats *directly* in spindle.

Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.

Integral Mount Jaw Chucks for precision holding of regular or irregular shapes up to 5".

Hardinge Model HLV 10" Lathe was primarily designed to fill a very old existent gap between the plain precision bench lathe and the heavy duty engine lathe.
Extreme accuracy, high spindle speeds, and thread cutting ability are coupled with power and ease of operation to obtain the desired results rapidly.

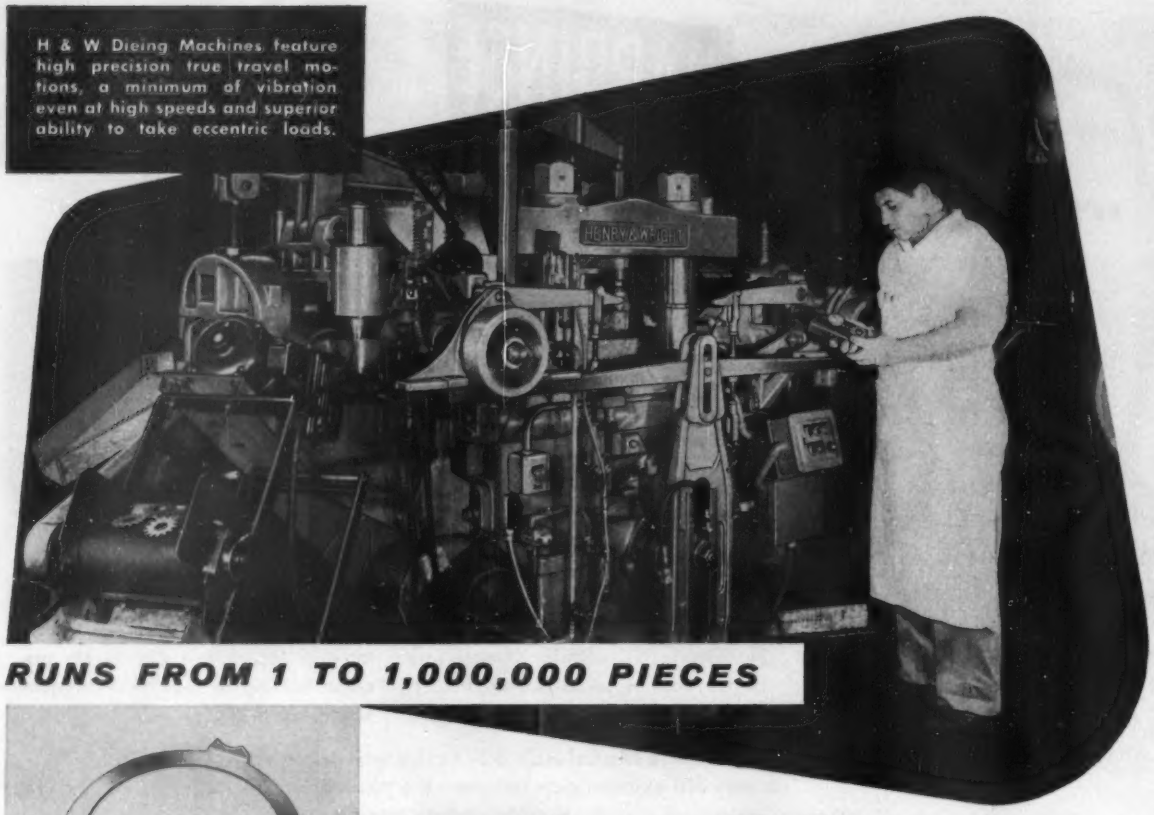
Write for Bulletin HLV



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

H & W Dieing Machines feature high precision true travel motions, a minimum of vibration even at high speeds and superior ability to take eccentric loads.



RUNS FROM 1 TO 1,000,000 PIECES

Parts like these, and three changeovers per day, too!

and nothing is made for stock

Production runs are from 1 to 1,000,000 pieces. Alloys, stock sizes, toolings differ for nearly every run. Yet Henry & Wright Dieing Machines in the plant of Wallace Barnes Company, Bristol, Conn., take care of this with nary a need to carry any of the production in stock.

Tooling changeovers are quick. Hence, deliveries are quick.

Precision is high. Hence, spoiled work scrap is low.

Some of the alloys are tough, others are highly workable. Some of the shapes are intricate, others are simple. None of the dies are "special for these machines"; all will fit any presses of sufficient tonnage in the shop.

Two, and even three, die changes are made per shift with no trouble at all. Henry & Wright Dieing Machines displaced five "conventional" ones.

Could your shop use a production method that is as simple, certain and smooth as this one? Would you like machines that can eliminate shelf inventory as a necessity for quick deliveries?

There is a lot more to the story. Please let us tell you all about it. Write to Henry & Wright, Division of Emhart Mfg. Co., 481 Windsor St., Hartford, Conn.

H & W Dieing Machines are available in capacities from 25-ton to 2500-ton.

HENRY & WRIGHT

Division of Emhart Mfg. Co.

HARTFORD, CONNECTICUT

UNION

Accuracy...

American "long rifles" of the 19th century, like the one shown here, pioneered in the true accuracy of small arms.

Among all modern cutting tools, those produced by Union are outstanding in their uniform quality, precision and long life.

Hammer and trigger guard of a percussion match rifle built about 1845 by Morgan James of Utica, New York.

REAMERS

Hand
Jobbers
Carbide
Expansion
Center
Shell
Rose Chucking
Chucking
Taper Pin
Helical Flute
Finishing
Roughing
Bridge & Boiler
Stub Screw Machine

TWIST DRILLS

END MILLS

HOBS

MILLING CUTTERS

GEAR CUTTERS

METAL SLITTING SAWS

COUNTERSINKS

COUNTERBORES

CARBIDE TOOLS

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

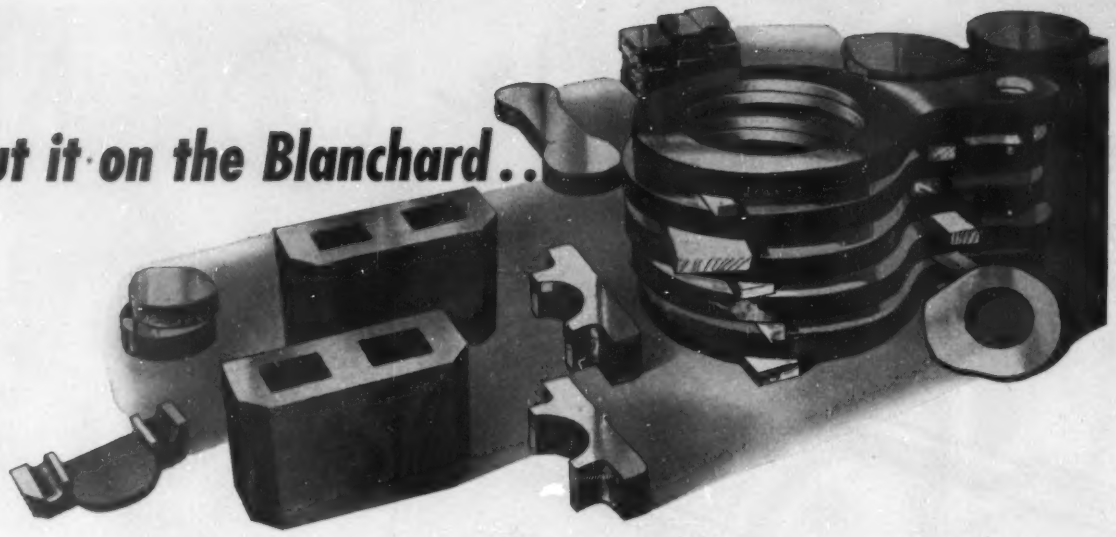
End Mills Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: **S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.**

BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

CUT INVENTORY COSTS, ORDER FROM YOUR LOCAL DISTRIBUTOR

Put it on the Blanchard..



it's versatile! Large and small shops alike find this Blanchard, with 72" diameter magnetic chuck, ideal for fast, precision grinding of miscellaneous work.

it holds multiple small pieces or plates, castings and die blocks up to 80" across corners, directly on the magnetic chuck. Irregularly-shaped workpieces are easily held with simple fixtures. (Custom-built grinders of this type can handle work 30" high.)

it's fast—with a hard wheel, soft steel can be "hogged off" at a rate of 10 cubic inches per minute.

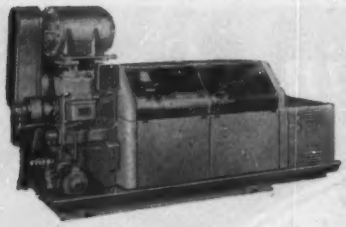
it's precise—with a soft wheel, hardened steel ways are regularly ground flat and parallel to .001", with surface finish of 5 micro inches!

No wonder shopmen say this Blanchard No. 42-72 is "tops for versatility"!

Send for free copies of "Work Done on the Blanchard" (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



A 3-WAY MARKETING SERVICE FOR USERS OF MACHINE TOOLS

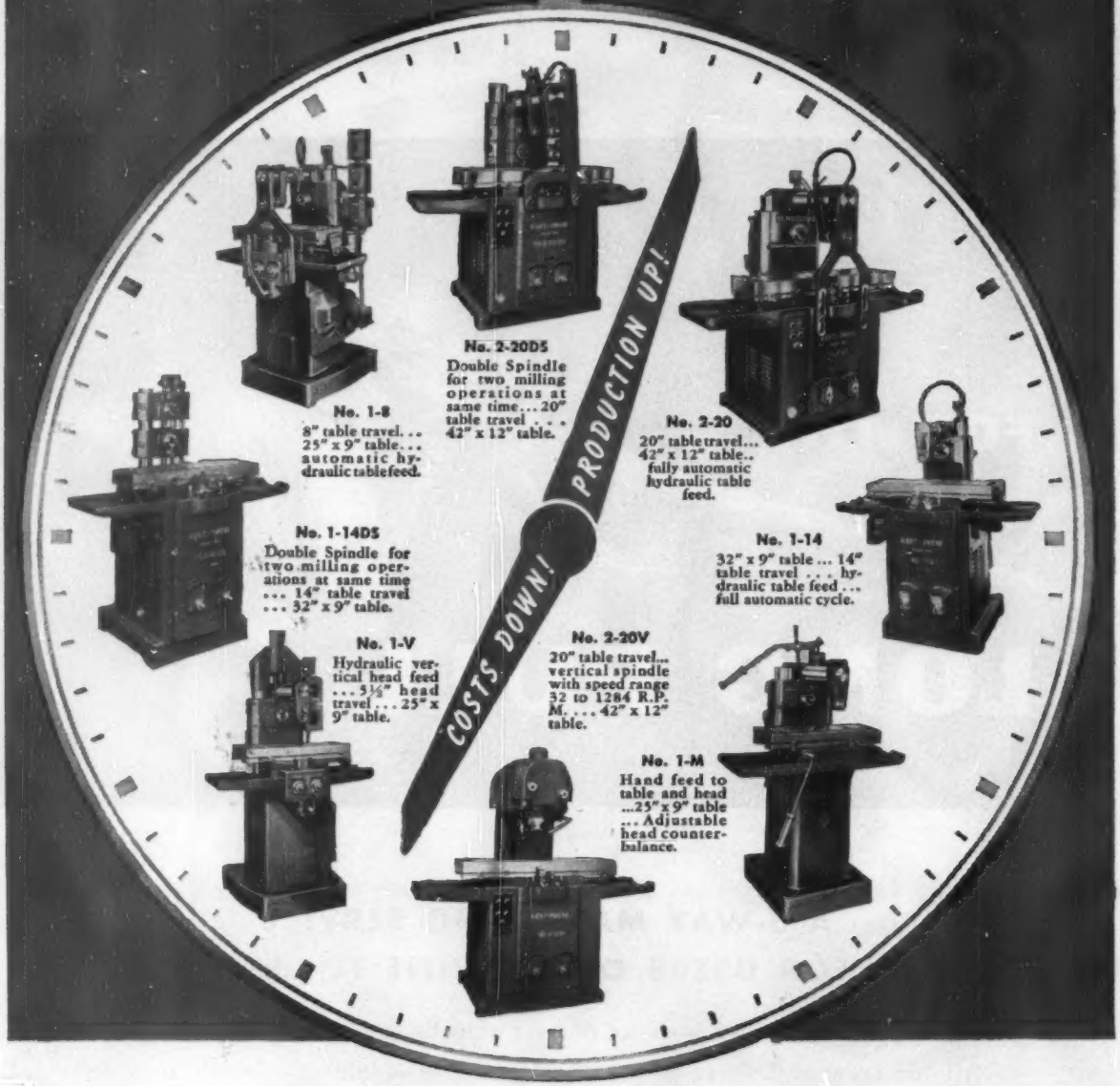
Jones & Lamson now offers a choice of ways whereby you can acquire new machine tools . . . on terms best suited to your own needs. In addition to outright purchase, with its obvious advantages, we offer a "Pay-from-Productivity" plan, on a 1-to-5 year basis, at interest rates as low as 3¼%*. This plan is designed for companies that prefer to finance modern machine tools out of the actual additional earnings these tools produce. Also, a lease plan — in 4 optional forms — for companies that lack the full cash purchase price, or have more pressing uses for their capital.

*(add-on rate)

JONES & LAMSON MACHINE CO.
502 Clinton St., Springfield, Vermont, U.S.A.

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES • AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES
AUTOMATIC THREAD & FORM GRINDERS • OPTICAL COMPARATORS • AUTOMATIC OPENING THREADING DIES & CHASERS

Time to *Reduce* Milling Costs!


COSTS DOWN!
PRODUCTION UP!
No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel . . . 42" x 12" table.
No. 1-8
8" table travel. . . 25" x 9" table. . . automatic hydraulic table feed.
No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.
No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.
No. 1-14
32" x 9" table ... 14" table travel . . . hydraulic table feed ... full automatic cycle.
No. 1-V
Hydraulic vertical head feed ... 3½" head travel ... 25" x 9" table.
No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.
No. 1-M
Hand feed to table and head ...25" x 9" table ... Adjustable head counterbalance.

KENT-OWENS REPRESENTATIVES

BOSTON
General Machinery Corp.

BUFFALO
Dan W. Peterson

CHICAGO
Four States Mach'y Company

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ROCHESTER
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Kent-Owens machines assure you of speed with accuracy . . . and cut your milling costs! Designed with advanced features . . . performance-proved for meeting tough schedules in production milling. Rugged . . . simple . . . versatile. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to cutter. Write for bulletins on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.

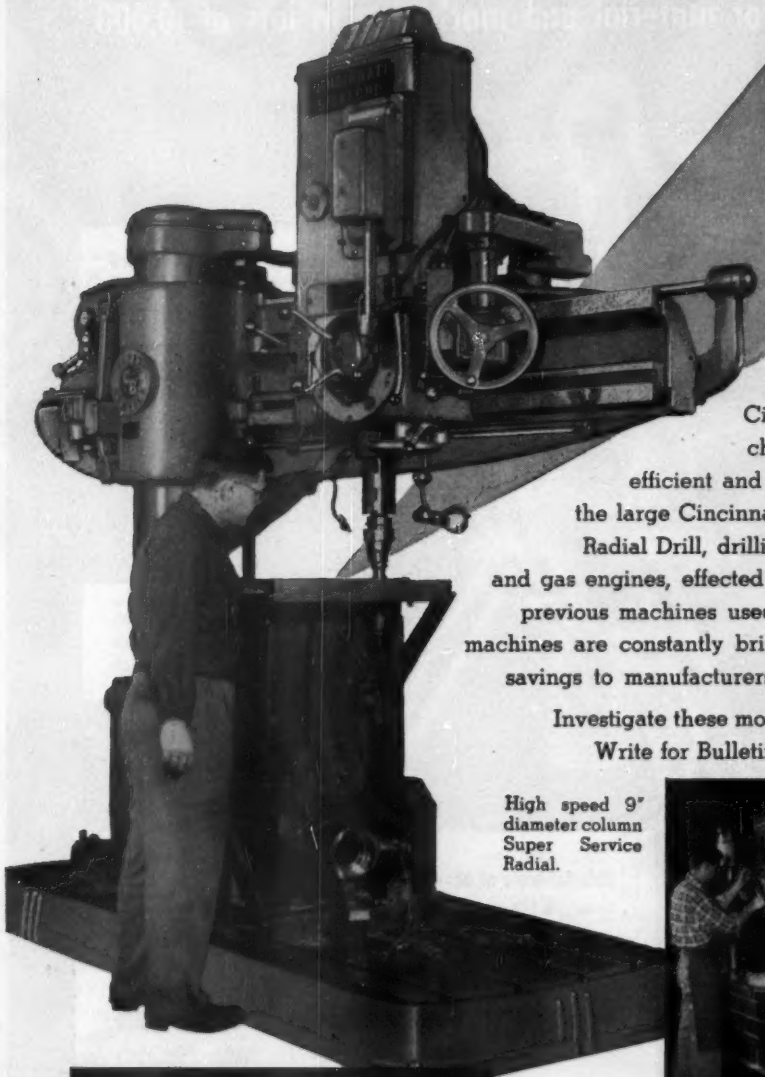
Call on

KENT-OWENS

for Milling Machines

"We find Cincinnati Bickford drilling machines ...very satisfactory!"

WHITE-ROTH MACHINE CORP.
LORAIN, OHIO



This shop is equipped with Cincinnati Bickford drilling machines. Their performance is efficient and profitable. For example, the large Cincinnati Bickford Super Service Radial Drill, drilling cast steel gear cases for diesel and gas engines, effected an 18% saving over previous machines used. Bickford drilling machines are constantly bringing savings to manufacturers.

Investigate these modern tools. Write for Bulletins.

High speed 9" diameter column Super Service Radial.

All geared 28" Super Service Upright Drill.

Photos courtesy White-Roth Machine Corporation, Lorain, Ohio.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.
Cincinnati 9, Ohio, U.S.A.

COST SAVINGS LIKE THESE... point to more

Actual cost figures for material and machining in lots of 10,000*
Brass . . . . . $.052 each
Steel . . . . . .068 each
Aluminum . . . .045 each
Brass . . . . . $.065 each
Steel . . . . . .047 each
Aluminum . . . .048 each
Brass . . . . . $.148 each
Steel . . . . . .160 each
Aluminum . . . .107 each
Brass . . . . . $.170 each
Steel . . . . . .190 each
Aluminum . . . .117 each
Brass . . . . . $.062 each
Steel . . . . . .050 each
Aluminum . . . .045 each
Brass . . . . . $.332
Steel 153
Aluminum 185
Material costs of above parts in lots of 10,000
Brass . . $.543 each Steel . . $.189 each Aluminum . . $.290 each
Production costs of above parts in lots of 10,000
Brass . . $.286 each Steel . . $.479 each Aluminum . . $.257 each
Material and Production costs of above parts in lots of 10,000
Brass . . $.829 each Steel . . $.668 each Aluminum . . $.547 each
Cost reduction by using aluminum
34.1% less than brass — 18.5% less than steel
*Figures given for brass and steel parts do not include the large plating costs that would have been necessary if these materials were used. Aluminum required no plating because of its natural attractive finish and resistance to rust and corrosion.

WITH KAISER ALUMINUM STOCK screw machine business for you!

LOOK at these cost comparison figures for the 6 screw machine parts in this camera tripod. It is manufactured by the R. J. Frisby Manufacturing Company of Chicago, a member of the National Screw Machine Products Association.

Frisby effected these savings because of the low material and machining cost of aluminum and because the natural attractive finish of aluminum required no expensive plating as with brass and steel. In addition, aluminum is so light in weight that substantial savings in postage were realized on this direct mail item.

Here's why *you* can cut costs, bid more competitively—and thus get more jobs—with aluminum. And you often get better parts at the same time.

- A pound of aluminum gives you up to three times more feet of stock than a pound of brass or steel. *Three times as many parts!*
- Aluminum permits you to reduce machine time; eliminate plating; extend tool life; and gives you a ready market for recovered scrap.
- *Better* parts can result with aluminum because it gives you a unique *combination of advantages*, including lightness combined with strength, attractive finish, high resistance to corrosion, excellent conductivity of heat and electricity, heat and light reflectivity.

Kaiser Aluminum

setting the pace—in growth, quality and service

Here's how EASY it is to machine aluminum!

More and more experienced operators have found that a few basic considerations are all that are necessary to successfully machine with aluminum. Foremost among these considerations is a simple change in tool angle—a *new angle* in screw machine work that means bigger profits for you—through aluminum!

1) Cutting Tools. Like any metal, aluminum machines best at certain tool angles. The same tool materials can be used, but some tools must be ground to new angles differing slightly from those used with brass or steel. Maximum efficiency is obtained when cutting tools are designed with proper rakes, clearances, and chip-breakers. Let your Kaiser Aluminum engineer or Kaiser Aluminum distributor recommend angles proved best by operators experienced in aluminum. Carbide-tipped tools should be employed on long runs, but are not necessary on runs less than 5,000 to 7,500 pieces.

2) Turning Speeds. On any existing screw machine, you can work Kaiser Aluminum stock up to the maximum efficient speed of the machine. Speeds and feeds selected will vary with depth of cut, whether operation is roughing or finishing.

3) Chips. Aluminum alloys commonly used in screw machine operations form chips that curl and break satisfactorily. Alloy 2011 (11S) breaks into small chips similar to brass. With other alloys, chip breaking grooves ground into the tool assist in producing chips that are easily handled.

4) Thermal expansion. Aluminum has its own rate of thermal expansion as do all metals. Experience quickly indicates how to compensate for this expansion. Recommended coolants are employed to assist in controlling this factor.

Valuable information is available now that will make it easy for you to use more profitable Kaiser Aluminum screw machine stock. Send for 165-page Rod, Bar and Wire Product Information Book. Also, write for Rod, Bar, and Wire Wall Chart on Weights and Availabilities. For this literature, at no obligation, write on your company letterhead to: Technical Editor, Kaiser Aluminum & Chemical Sales, Inc., 228 N. La Salle, Chicago 11, Illinois. (For others wishing the Product Information book for a personal library, the price is two dollars per copy.)

If you are already machining aluminum, call a Kaiser Aluminum sales engineer or your nearby Kaiser Aluminum distributor for immediate assistance in obtaining aluminum stock for your specific needs. We believe we are ideally equipped to work with you, because our efforts are put behind the job of serving manufacturers—to help improve their products and reduce costs.

Look for our local number in the classified telephone directory under the heading "Aluminum," or contact one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, Calif.

Polishing goes automatic ▸

goes automatic ▸

...with
BEHR-MANNING
coated
abrasive belts

Better finishes and
Better production with
BEHR-MANNING
coated abrasives
and methods

Fast-cutting BEHR-MANNING® Abrasive Belts on these Acme Manufacturing Company automatic machines clearly demonstrate the production increase possible with modern mechanized methods. In the photo above, aluminum parts are automatically rotated to the polishing stations. At left, bumper guards travel automatically past a series of floating head polishing lathes equipped with BEHR-MANNING Belts. For details on these and other modern methods, write Behr-Manning, Troy, N. Y., Dept. AM-12.

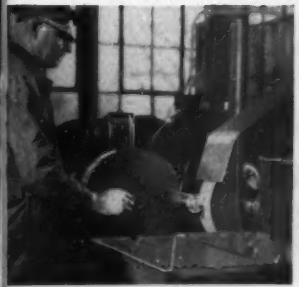
In Canada: Behr-Manning (Canada) Ltd., Brantford. For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

BEHR-MANNING®

BEHR-MANNING

division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES



Belt polishing saw arbors with a two-spindle indexing fixture.

Off-hand contour polishing on narrow belt.

Orbital type sanders save time and produce finer finishes.

Cutting power of the abrasive disc increases production.

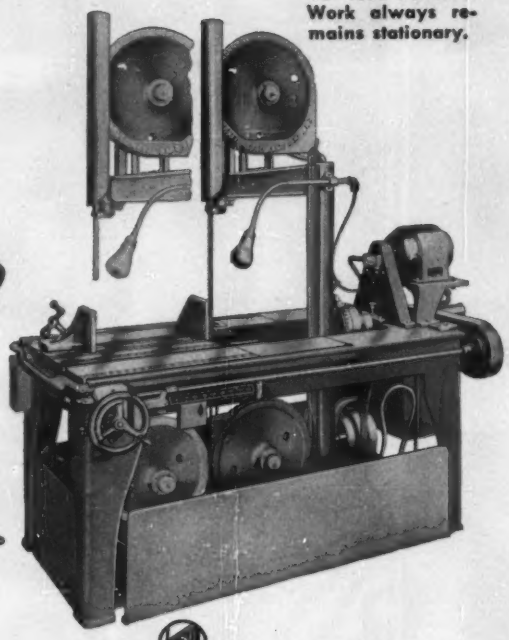
G-12

Never Confuse the No. 8 MARVEL with an ordinary Band Saw

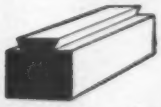
...only the MARVEL is Universal

Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.



Only a No. 8 MARVEL can do all of these things: Snip-off a ⅛" rod or cut-off an 18" x 18" cross section

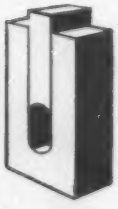


Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams.



Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimum chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS

Better Machines-Better Blades

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or small...

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IS THE FIRST NAME TO CALL WHEN YOUR MACHINING NEEDS

Job-Engineered

SPECIAL TOOL DESIGNS

26 CUTTERS ON THIS SPECIAL TOOL BORE, TURN AND FACE HOLES RANGING FROM 22.500" TO 55.75" IN DIAMETER

2 BLOCK-TYPE CUTTERS IN THIS SPECIAL TOOL ROUGH, FINISH AND COUNTERBORE HOLES RANGING FROM 2.180" TO 2.420" IN DIAMETER

Yes, large or small, simple or complex, you always tool jobs better with Davis. One reason is the big, extra bonus of machining know-how that goes into every Davis tool.

In the design of special tools, like those above, Davis' broad experience and unsurpassed engineering skill assure recommendations complete in every detail of speeds, feeds, fixtures and maximum combination of multiple operations into single tools for increased production at lowest cost.

DAVIS ALSO OFFERS INDUSTRY'S MOST COMPLETE STANDARD TOOL LINE

In standard blocks, boring heads, bars, and tool sets, the Davis line features thousands of items to assure unrestricted selection in tooling up virtually any routine job.

Your local Davis Field Engineer is as close as your telephone, and behind him are the complete facilities of Davis' application engineering department, ready to serve you with special or standard tools.

DAVIS BORING TOOL DIVISION of Giddings & Lewis Machine Tool Company Fond du Lac, Wisconsin

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Size and
Type
is easy as **A B C**
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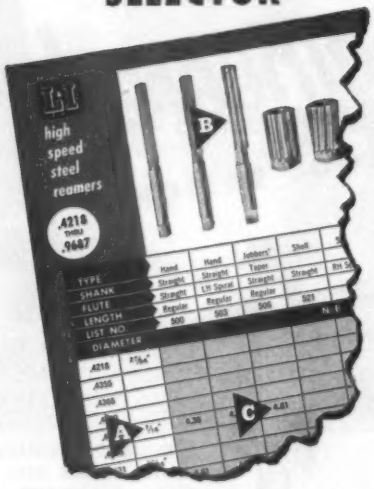

Now for the first time you can **A** pick the size reamer you want from L&I's long list of standards, **B** select the type best suited for your job, and **C** find the **NET** price quickly and easily. And every reamer is available **FROM STOCK.**

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

One Little Letter

What a difference one little letter can make! In your description of the Gleason Rolling Quench machine (*AM*—Oct 25, '54, p185) you indicate the flow of quenching fluid as 350 gph. It should, of course, have been 350 gpm, which is sixty times more than the "h" would indicate. With that capacity it really does a man-sized quenching job.

Norman M Howden
Director of Publicity
Charles L Rumrill & Co Inc
Rochester, NY

Somebody's finger hit the keyboard one up and one to the left, but what a whale of a difference it made! We certainly did not mean to imply that the new Gleason was a Junior Model.
—Ed.

How Much Science?

I have just been reading about that 1000-man plant in England that tossed out scientific management (*AM*—Aug 16 '54, p157). They seem to have made it work, but I can't see how.

What wonderful opportunities it offers for graft and for personnel problems, with each foreman doing his hiring and firing. And what a tremendous amount of duplication there must be. It sounds like an American government office. One foreman will have a draftsman with only enough work to keep him busy for an hour a day, while another perhaps has three men working overtime. And if a foreman, housewife-like, forgets to order some essential parts, does he run next door and ask to borrow a cup of nuts and bolts?

How about material costs? Can they save money by having two or three people buying 100-lb lots of steel every week or two, instead of buying in carload lots for the whole plant?

I'll admit some of their ideas sound excellent, and it is probably a wonderful place to work—one real happy family. But I feel sure they could save a great deal more money by installing real scientific management. Their trouble was not that they had scientific management and threw it out, but that they had thoroughly unscientific management.

GRINETICS

BY D G SMITH

FINAL INSPECTION

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Seeing was believing for a group of mechanical officials from one of the mid-west's most prominent earth moving equipment builders.

Frankly they just wouldn't believe that the new 32" "AMERICAN" Pacemaker Lathe would effectively use 60 horse power and cemented carbide cutting tools in machining rough alloy steel forgings. So they came to see for themselves and they saw:

1. Cuts 1⅛" deep.
2. Cutting speed 300 feet per minute.
3. .030" feed.
4. 60 to 65 horse power registered by horse power meter during the maximum cuts.
5. Not a shimmy or whimper from the machine.

They were amazed and convinced.

This new model Pacemaker is endowed with the power, stamina and convenience that combine to produce a thoroughly dependable and highly productive unit.

Bulletin No. 44 tells all . . . have one?

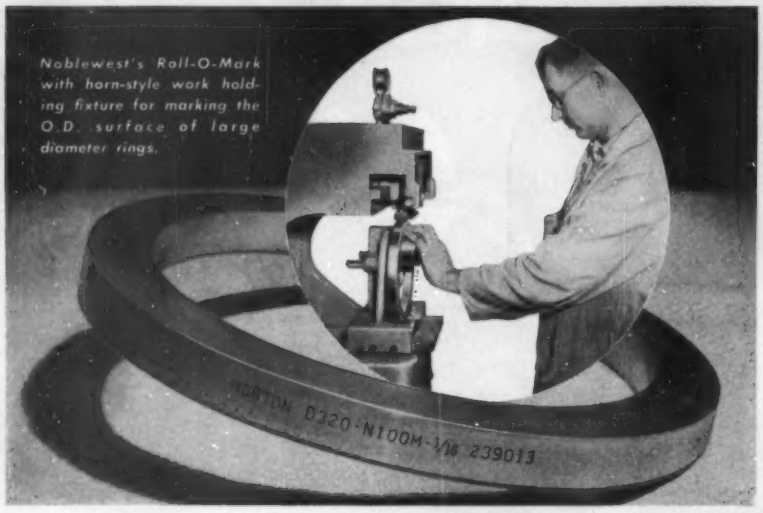
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

NEW HEAVY DUTY **ROLL-O-MARK**

MULTI-PURPOSE METAL MARKING MACHINE



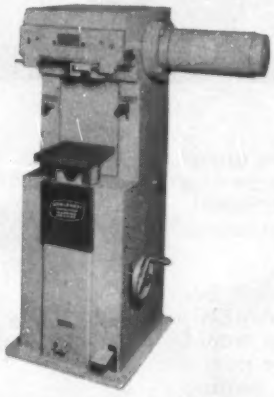
Noblewest's Roll-O-Mark with horn-style work holding fixture for marking the O.D. surface of large diameter rings.

FEATURES

- ***Extra large work capacity***
- ***Greater versatility***
- ***Marks, numbers, graduates, embosses***
- ***Low operating cost***

Marking the surface of large diameter rings is just one of the many applications that are being done faster, better and at lower cost in many industries today with the new heavy duty all-pneumatic Roll-O-Mark. This one machine can be tooled for marking round or flat surfaces . . . precision graduating . . . serial numbering . . . knurling . . . and embossing.

Whatever your needs for metal marking, Noblewest makes the machines, marking dies, and work-holding fixtures for doing the complete job. And remember, Noblewest Roll-Marking is *permanent* marking—*good for the life of your product.* There is a Noblewest representative near you. Write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Conn.



All-pneumatic, Model 365 is the heavy duty version of the famous Model 50P1.

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MARK IT BEST WITH

NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

They went overboard on paper work to such an extent that they lost all sense of proportion and were probably doing things like making out absentee reports in septuplicate and sending copies to everybody from the chairman of the board to the office boy.

I'd like to place a small bet that they could save a great deal more than £15,000 a year by real scientific management, even if it did involve such heresies as keeping an accurate check on the man-hours spent on a job, or fixing the same wage rate for two men doing identical work in two different kingdoms (departments, that is).

J Brockman
Indianapolis

Medal for Kolesov

Regarding the controversy about the Kolesov method (*AM*—April 12 '54, p170), I think that even if it was used occasionally before its discovery by him, credit must be given to the Russians for having adapted it to modern, carbide-tool-equipped machines, and to such an extent as to become a standard procedure. There can be no doubt that this method is in wide use in Russia and other Communist countries, because their technical journals are full of it.

Twelve years ago, I used a similar method, but with HSS tools for producing small parts in brass and bronze for instrument work. I must confess, however, that I probably would not have thought about employing the technique for heavier work—turning disks for textile yarn beams—as I have been doing lately, without reading about the Kolesov method .

M Barash
ATA Textile Co,
Haifa, Israel

Oh Men, Oh Women

In reference to the suggestion made by Mr. Parkhurst (*AM*—Oct 11 '54, p106) that the words Positive and Negative be used instead of Male and Female; I gulped when I read it and finally decided to enter the arena. I cannot recall blushing or noting an increase in breathing, even in my younger days, whenever anyone referred to a female gage or part.

I readily appreciate the delicate finesse with which Malcolm feels that the substitution should be made but, after all, we're living in a mechanical age where things are being reproduced, if you will, on the automatics. I skipped over to my *Cen-*

tury, just for the ducks, to look into the word "Male," and in addition to the bla bla about broads, eggs, and grasshoppers, I noted this: "Pertaining to or noting some inanimate object associated or contrasted with another as its compliment or opposite." Adjusting my bifocals and bending my neck farther, I find another interesting fact: "The ancients called sapphires male and female according to their colors—the deep-colored or indigo sapphire was the male; the pale blue, approaching the white, the female." Tsk, tsk! How shocking! Insatiable me, digging deeper to get to the oil, came upon the following: "Male screw, a screw of which threads, carried about the exterior surface of a cylinder, correspond to and enter spiral grooves (should have been helical) formed in the surface of a cylinder hole and constituting a female thread."

To try to replace Male and Female with Positive and Negative would be like trying to bail out the Pacific with a thimble. We might lower the tide a smidgeon if we used the words, Internal and External, but we'd still have a heck of a lot of water left. We'd better console ourselves with Male and Female and I'm certain we won't have any trouble whatsoever in keeping our minds above the belt.

John Homewood
Burbank, Calif.

Cutoff

Reading of the article by Mr Winch in Practical Ideas (*AM*—Sept 27 '54, p143) reminded me of a similar application I made in the early 1940's.

We had a myriad of short pins of 3/32-in. brass stock to cut off and radius chamfer one end. The other end was to be free of cutoff tit. Lot lengths were to vary by 0.07-in.

A block of CRS was fitted with a guide bushing, as in Mr Winch's case, and a cross-slot milled to take a ¼-in.-sq toolbit so its top face was on the bushing centerline. A stop screw, in axial alignment with the bushing, gaged the part length. A 3600-rpm fractional-hp motor was secured to one end of a bench and fitted with a small chuck. A wooden bedway was nailed to the bench to make a way for the block assembly, and a foot switch for the motor was arranged to slide along on the floor.

The operator chucked a 12-ft bar, started the end into the bushing and, —"we're off." I believe he could manipulate the slide and advance the block along the stock faster than we could time a 00-G B&S.

V C Boydston
Tulsa, Okla

So Efficient—

OLIVER ACE

Universal Tool and Cutter Grinders

The Oliver ACE grinds cutters of all types—increases productivity—and offers unsurpassed advantages for your toolroom. Four decades of proved dependability makes possible these 4 most important advantages:

1 **Easy to operate**—the ACE requires no computation . . . direct reading for clearances . . . reduces fatigue . . . eases operators' jobs in grinding the most difficult cutters.

2 **Speedy to operate**—the ACE cuts time lags to the bone . . . simplicity of design and operation makes economy of motion and fast grinding certain.

3 **Precision guaranteed**—the ACE handles a wider range of cutters than ordinary cutter grinders (includes high speed and tungsten-carbide work) . . . only two simple fixtures required.

4 **Economy assured**—the ACE is unmatched for its unexcelled ease, speed and precision of operation. It is not only easy to set up but needs only a small amount of floor space and requires less outlay in dollars.

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—Reduces Fatigue
—Eases Operators' Jobs

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Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular wood saws.

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DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
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DIE MAKING MACHINES

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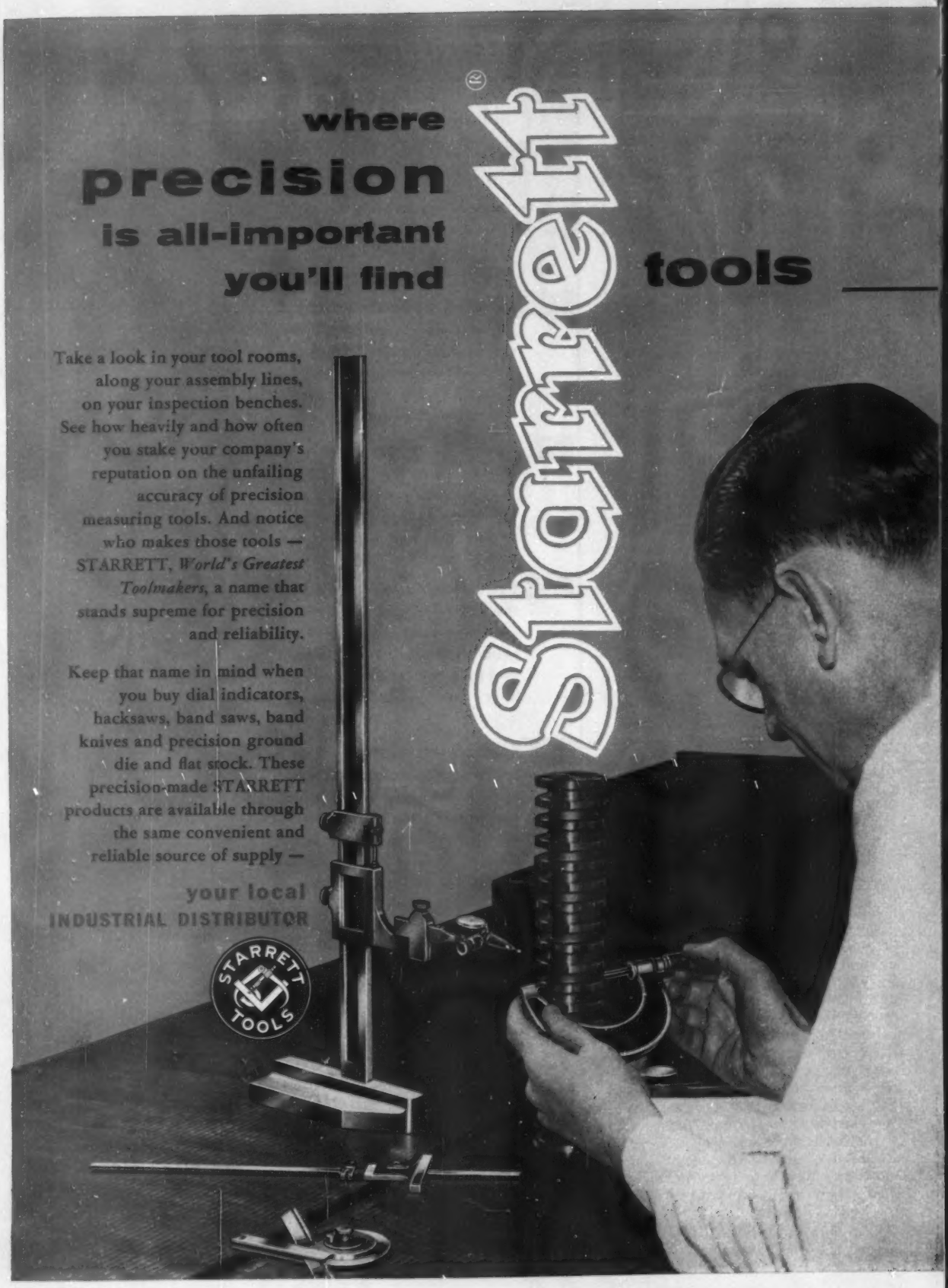

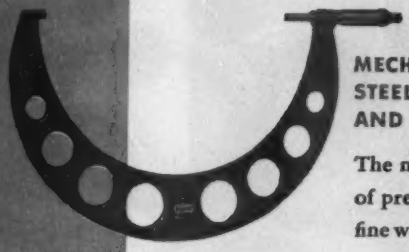

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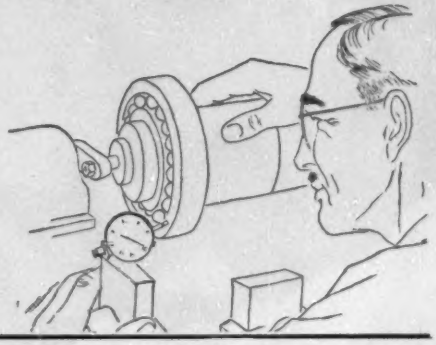

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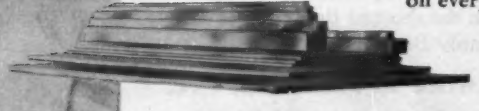

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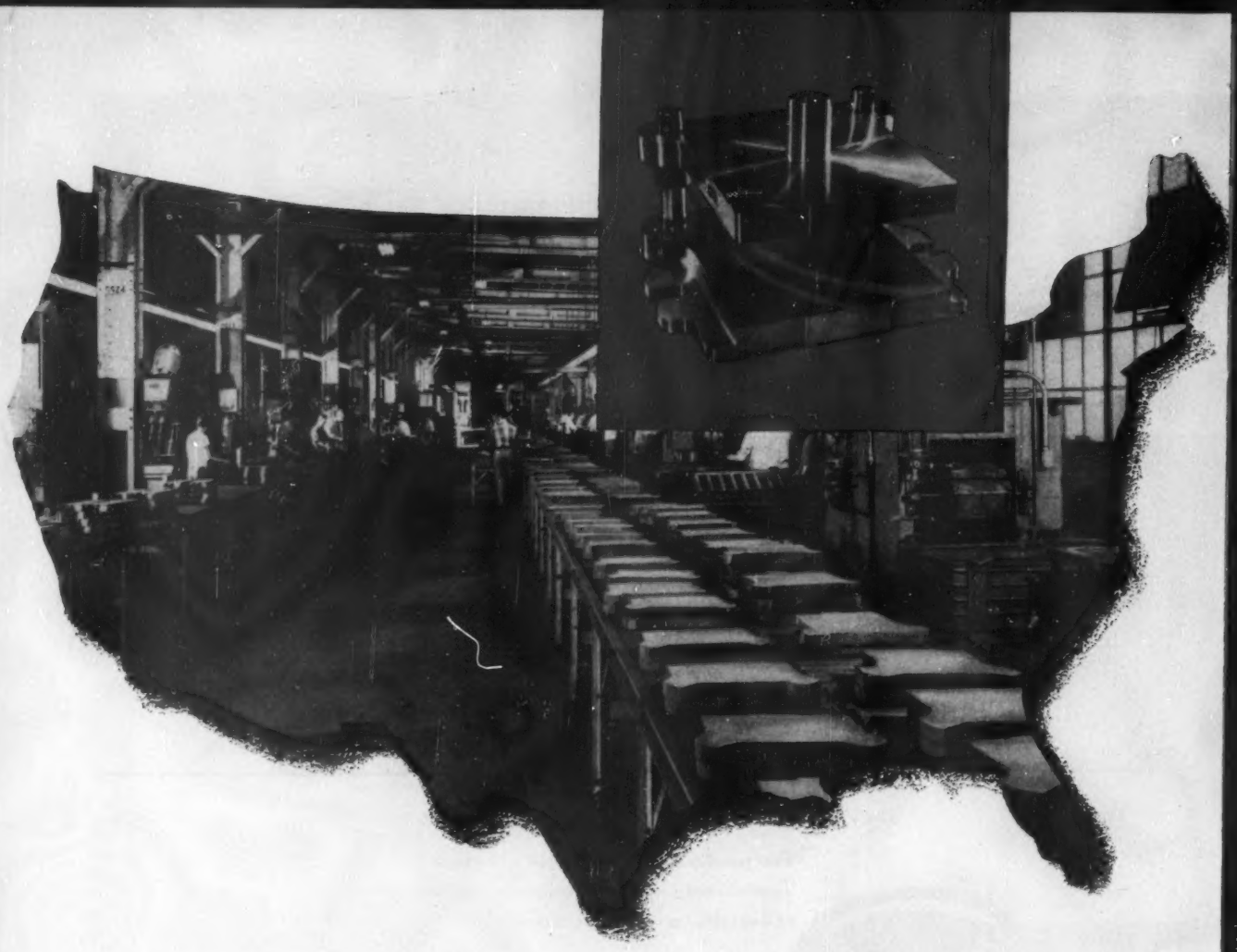

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FIRST, Danly is able to apply mass-production efficiency in manufacturing high precision, *interchangeable* die set components to the traditional Danly quality standards. **SECOND,** each Danly Branch is stocked with thousands of these *interchangeable* die set components, for immediate assembly to meet your tooling requirements. **THIRD,** Danly Branches are strategically located throughout the United States in major toolmaking centers to give you quick, local delivery. So, when you want the finest die sets in the shortest time . . . just call your nearby Danly Branch.

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INDIANAPOLIS 4	5 West 10th Street
LONG ISLAND CITY 1	47-28 37th Street
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MILWAUKEE 2	111 E. Wisconsin Avenue
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DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

Spot News of Metalworking...

- **AUTOMATION AND UAW ...**

  If UAW-CIO's Walter Reuther has his way, automation will be teamed up with the Guaranteed Annual Wage, to become 1955's top labor issue. His contention: if a plant is automated, every production worker in that plant should be upgraded to share in the savings achieved by automation. See pp 127 and 190.

- **ALLOYABLE PLASTICS ...**

  Plastic materials that can be alloyed like metals to meet specific requirements have been developed by a British firm. Plastics, by alloying, can be given a variety of properties, such as transparency and hardness in combination. The new plastics also (1) resist 200 C heat, (2) won't craze or suffer from fatigue, (3) can be made clear as crystal for lenses, (4) are unbreakable, (5) won't scratch.

- **RAILWAY BEARING TESTER ...**

  A machine that approximates the conditions freight car journal bearings are subjected to in transcontinental trips in all seasons, has been installed at Association of American Railroads' Research Center in Chicago. Within a few days, the machine can measure bearing wear equivalent to years of service.

- **EQUIPMENT/LAND RATIO ...**

  The ratio of plant and equipment to land and buildings will change from the present 2:1 to 4:1 within a decade, a GE official predicts. Main reason for the change, he says, is the increasing automation of plants.

- **RUSH WORKERS ...**

  A New York employment outfit is set up to furnish from 1 to 100 workers to help out in rush periods at plants. The employment firm retains the workers on its payrolls, collects a fixed hourly sum from the plant. Help is available for as little as 4 hrs' work, or for as long as plant needs the worker.

- **GOVERNMENT TOOL LEASE INTEREST RAISE ...**

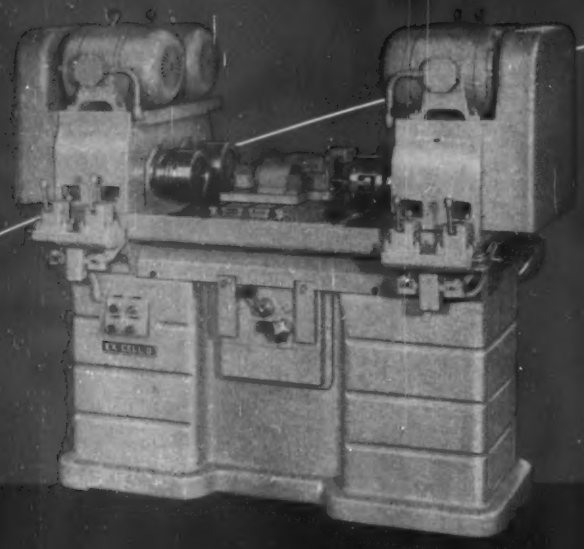
  The Armed Services now plan to charge 2%-a-month interest instead of 1% on machine tools made since 1949 and leased to private industry for civilian use.

- **RCA'S PATENTS ...**

  Possible outcome if the government wins its antitrust suit against Radio Corporation of America: government could put hundreds of RCA electronic patents into the public domain. It's happened before—just last year when General Electric lost an incandescent lamp antitrust suit.

- **AIRCRAFT MACHINE TOOLS ...**

  Faster speeds and feeds, higher horsepower and more versatility will keynote forthcoming machine tool specifications for skin and spar mills, general-purpose and horizontal mills, profiling and contouring equipment. Specifications are being developed jointly by airframe makers and machine tool builders. See p192.



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STYLE 1212-A. For identical or different operations at each end. When loading time of parts approximates the time of machining, a double-end machine practically doubles production capacity.

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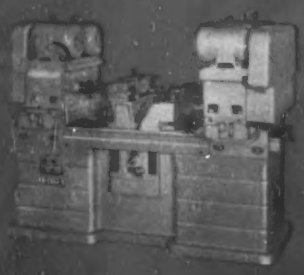
STYLE 2112-A. Single-end model for workpieces in the small and medium-size range. Flexible hydraulic controls give easy adjustment of multiple operations.

STYLE 112-C. Large and sturdy with long stroke. Accommodates medium and heavy work, gives maximum precision production, minimum operating cost.



STYLE 17. Massive construction. Maintains the highest precision standards on a profitable production basis. Economical in operation, can be set up for variety of jobs.

With this versatile equipment, you can precision bore, turn, face, counterbore, chamfer, and groove.

These machines are standard, yet they'll handle a large variety of precision operations. Ex-Cell-O also has the standard items of tooling to make this possible at minimum cost.

These fast, sturdy, flexible Ex-Cell-O machines are *profit insurance*. For years to come they will keep on turning out *precision work at maximum production speeds.*

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54-2

Washington . . .

Government's Export Financing Program has gotten off the ground. Export-Import Bank runs the plan, has already granted lines of credit to four US firms. Oliver Corp, farm machinery maker, has gotten a $10-million credit line; Combustion Engineering Inc, steam-generating plant builders, $4-million; LeTourneau - Westinghouse Co, earth-moving machines, $3-million; and Worthington Corp, industrial equipment producers, $4-million.

As the program shapes up, Ex-Im underwrites up to 60% of a US exporter's sale. The foreign buyer must pay 20% down, the exporter assuming the risk on the remaining 20% of the sale price. Idea of the share-the-risk scheme is to put the damper on fly-by-night traders. Once Ex-Im okays a deal, it arranges with a private bank to handle details. The bank makes the loan, Ex-Im guarantees it.

• • •

Recent Navy cancellations of $372 million worth of aircraft contracts may turn out to be "backlog" losses only, not fiscal losses, for at least two firms involved. Navy knocked out $135 million contract with McDonnell aircraft for 200 F3H2 "Demon" shipboard fighters; $75 million with Chance Vought for 96 A2U1 fighters; $36 million with GM-Allison for J71-A2 axial flow turbojet engines (for F3H2's); 75 million with Westinghouse for J46-WE18 turbojet engines (for A2U1's). McDonnell and Chance Vought component suppliers lost an additional $51 million worth of contracts for radars, hydraulics, fire controls, servo-mechanisms, and other equipment.

McDonnell will still go ahead with production of 50 F3H2's. So all development money spent for this series type is not a total loss. Reason for cutting out 200 planes from the program, say Navy sources, is delay in development of Allison's engine, which has not yet met performance qualifications of that type of engine. This means planned output for the plane, set through 1957, will be cut back about 18 months. It's likely McDonnell will be awarded a contract for another plane in the same series.

Here's background on this: in setting Navy requirements, development of the airframe, engine, fire control, and other equipment is phased into carefully integrated research-to-development-to-production states. If development of any one of these components slips, then there's slippage in other phases.

That's what happened to the case of the F3H2 aircraft systems. Engine development fell behind. For what reason, only Navy and Allison can tell. So the Navy requirement was that McDonnell complete and deliver a lesser number of craft. This means Navy operational fighters should be able to meet a certain military readiness at a specified future date. At the same time, Navy has scheduled another fighter type to phase into production at a certain time within F3H2's life cycle to meet still another future combat readiness point.

Meanwhile, Air Force has unveiled McDonnell's new F-101 Voodoo — a supersonic jet that can escort atom bombers deep into enemy country, or can carry atomic weapons itself.

• • •

Anti-trusters have dropped a bombshell into electronics. Justice Dept has filed a suit that RCA has monopolized Radio-Tv research and patents. Real target is RCA's "package licensing" policy. Justice claims this is restrictive, since other electronics firms are required to take licenses on all RCA radio-tv patents — involving higher royalty payments — even though they may want to use only one or two.

• • •

Chances are almost nil that extra fast tax writeoffs for plant expansion will be granted as a result of ODM's recent checkup on unused defense amortization certificates. There had been some thought that new writeoffs would be okayed for expansion in some defense industries to replace writeoffs not used by other firms.

But now ODM figures that its original expansion goals for most defense producers were big enough — that there's no need to take up the slack. Besides, ODM feels there's been considerable expansion without fast tax writeoffs. Some firms have been granted accelerated amortization, then haven't used it.

• • •

The White House is going in heavily for "administration by committee." It has at least two dozen committees, commissions, and task forces at work studying subjects as varied as shipping subsidies, foreign aid, revision on anti-trust laws, export subsidies, government procurement. Their recommendations are coming in now, most likely will serve as basis for much of Eisenhower's legislative program next year.

• • •

Maritime Administration has ordered four new high-speed tankers. Contracts went to Sun Shipbuilding & Dry Dock for three $6.5 million ships, to Ingalls Shipbuilding for one $8 million vessel.

• • •

New NLRB decision involving a steel fabricator will stir up some fuss in union bargaining. The Board ruled that if a firm turns down a wage raise on grounds that it can't afford to pay, then union can take a look at company books. Lawyers say you can get around this by turning down wage demands on other grounds.

This ad is reproduced through the courtesy of AMERICAN TYPE FOUNDERS

*** DE VLIEG OF DETROIT**
... is proud to reproduce this unsolicited advertisement by American Type Founders as it appeared in nationally circulated technical magazines.

This machine hunts for—and finds—dead center!

This De Vlieg Jigmil is used to locate and bore the cylinder, gear-driven ink rollers, and gear bearing holes in ATF Chief frames.

Once the adjustments have been set, the Jigmil automatically positions every subsequent frame by moving its machine table or spindle head until the desired center is located to within 3-5/10,000ths of an inch. Then this 12-ton precision borer is micrometer-set so accurately that it will remove a pencil mark from a boring without cutting the metal.

Bearing holes not so accurately located on the press frame could easily throw cylinders out of parallel, cause excessive wear to precision gears, make smooth high-speed operation impossible and take years off the productive life of a press.

That's what we mean when we talk about the precision engineering that goes into an ATF Chief. You won't find more accurate borings in any press regardless of price. It's like getting Cadillac construction for Chevrolet prices.

It will pay you well, next time you're in the market for a small offset press, to ask for the full story on the precision-engineered ATF Chief. Write AMERICAN TYPE FOUNDERS, *a subsidiary of Daystrom, Inc.*, 200 Elmora Avenue, Elizabeth, New Jersey.

Better, More Profitable Printing from the Widest Line of Processes

GRAVURE . . . LETTERPRESS . . . OFFSET

*** *Come to Detroit*... SEE A PRACTICAL DEMONSTRATION OF "JIGLESS BORING"**

DE VLIEG MACHINE COMPANY • 450 Fair Ave., Ferndale • Detroit 20, Michigan

A request on your company letterhead will bring a copy of our comprehensive illustrated catalog.

Detroit . . .

The quarter-of-a-billion dollars bet by Chrysler on its 1955 models appears to be paying off. With dealer orders for its five car lines totaling over 350,000, and with 10,000 orders a day rolling in, the corporation raised its fourth quarter production by 10%, to about 280,000 units.

One source said Dodge alone has orders which represent about five months' straight-time production under present schedules. That could not be immediately confirmed, but C L Jacobson, Chrysler vice president, said the corporation's main manufacturing and assembly plants are working two shifts on overtime schedules to meet demand.

• • •

H H Curtice, GM chief, believes that about 5.8-million cars and nearly a million trucks will be built by the industry next year—about 10% above 1954 totals.

In recent years, the projections of GM market analysts have consistently been most accurate.

The Detroit Mayor's office, the Board of Commerce and other agencies, though, want it known by out-of-staters that there is no room for more job seekers in the motor city.

The Board of Commerce cited a six-month period in 1953 when over 100,000 job hunters landed in the Detroit area. Much of that influx, the B of C neglected to mention, was stimulated by recruiting programs of auto companies.

Cancelation of war contracts, coupled with a dwindling auto market, shot unemployment totals in the state up to about 287,000 early this fall.

Between Sept 15 and mid-November, however, unemployment in Greater Detroit fell from 195,000 to 117,000 and statewide unemployment was down to 185,000—a decrease of about 102,000 in the two-month period.

• • •

Appearing on p 190-191 of this issue is a report on the CIO Auto Workers' union's highly ambitious demands on the auto industry in 1955. (During the current season, when it is fashionable to appraise next year's economic picture, it's well to remember that UAW, insofar as the auto industry is concerned, will be fully capable of throwing every last estimate completely out of whack).

The general comments of a veteran auto company industrial relations man cast a little light on the industry's reactions to the union's posion on the guaranteed annual wage:

"I have no doubt that Reuther has figured a way of overcoming the objections he will get from his own people on the matter of the seniority system and how it fits into the guaranteed wage, but how he'll do it intrigues me.

"That is, say Employee A has 25 years' seniority, Employee B has 10. The company can't sell its production, so it lays off workers. Employee B goes home, paints the house, watches TV and drinks his beer.

"Maybe he does that for two weeks, then he's recalled. He's paid for his laid-off time, under the guaranteed wage. Meanwhile, Employee A has been at his machine for 80 hours during the two weeks B was lolling around the house. Is the high seniority worker going to buy that very long? I don't think so."

UAW, of course, believes otherwise. It says the plan will not turn seniority clauses around. The union says there will be many reasons why a worker will prefer to work, rather than be laid off, even if he can draw 52 weeks' pay without working. Among the reasons:

"In a widespread recession, the high-seniority worker will know that he is safeguarding security for himself and his family by remaining at work until layoffs finally reach up to his place on the seniority list."

If he is finally laid off, he "will be using up that security instead of adding to it."

A laid-off worker must be available for all other "suitable" work. If he takes a job at another plant, that job "will probably not be as desirable as his job in his own plant. It may be farther from his home, it will involve working among strangers . . . involve learning new tasks, and so on. Most workers would prefer to keep their regular jobs."

What about reports that companies will build up large inventories of finished products, in order to have something to sell if and when they're struck? Said the industrial relations expert:

"Doubtless companies will be trying to build up a float, especially at certain highly vulnerable plants, such as foundries. But I don't think Reuther will let anybody stockpile autos in any great numbers. Don't forget, he's got as much or more control over production schedules than the companies have."

Who will UAW approach first?

"He's got a wide-open choice. If I had to bet on it, I'd say Ford."

Is there any truth to the rumor that GM, when it agreed to reopen its five-year contract in 1953, did so only after it had won from Reuther a gentlemen's agreement that UAW would not open up first on GM in 1955?

"I've heard that story. I'm convinced there's no truth in it."

Is Reuther so far out on the limb that he can't back off from demands?

"Of course not. He can compromise in every area. He was out on a limb in 1950, too. But when the Pandora's box was opened and all the goodies flew out, he compromised. He can do it again."

5410

NOW CUT COST OF PRECISION GEAR PRODUCTION

THIS FEATURE: "*Independent* selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,

AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.

THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,

CONTRIBUTES to more gear precision with no sacrifice of gear production,

OR INCREASED gear production with no sacrifice of gear precision, ... OR BOTH!

Prices and specifications without obligation

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The Hamilton Tool Company
830 South Ninth Street
Hamilton, Ohio

IT'S A **Hamilton Tool**

USE IT WITH CONFIDENCE

Machine Tools . . .

Defense orders are about 14% of current new orders for machine tools, Tell Berna, general manager of the National Machine Tool Builders' Association, revealed at the NMTBA's annual meeting on November 18.

Foreign business constitutes around 9% of the industry's total, he said. That compares with a traditional 20% over a long period of years.

Chances of increasing export orders in proportion to total volume appear remote, even if restrictions imposed on importations of American tools were removed by foreign countries.

• • •

Expansion of domestic metalworking industries and modernization of shops now comprise 77% of the machine tool market, as measured in actual sales. Within this area is the one great hope of closing the gap that long has existed between the volume of new orders and of shipments, Mr Berna declared.

Meanwhile the nation's capacity for producing machine tools, Mr Berna stated, has been ebbing away. A year ago it was $120 million a month. Today it is close to $100 million a month.

Mr Berna called attention to the fact that the total of $100 million to be spent by the Defense Department for reserve machines is equal to about seven-weeks' production at the industry's present rate.

• • •

Welcome to the machine tool industry is the news that the Defense Department's $100 million for reserve machine tools will be stretched over a wide variety of small and medium-sized tools as well as large long lead-time machines.

Graham E Marx, director of the Metalworking Equipment Division of the Business and Defense Services Administration, brought out this fact at the NMTBA meeting.

• • •

Some $84 million of this fund will be spent by the Air Force, as previously revealed on this page.

All invitations to bid, evaluation of tenders and final procurement will be handled from the Air Materiel Command at Wright-Patterson Field at Dayton, Ohio.

Mr Marx said that a selected group of machine tool builders, users and Air Force personnel will act as consultants to a special procurement group. A tentative list of machines has been prepared.

• • •

Builders were urged by Mr Marx to stay away from Dayton while the Air Force gets organized to do its buying job. As soon as possible, all eligible builders will be issued invitations to submit full engineering specifications and sales proposals on their types of machines.

When builders receive an invitation to submit data, Mr Marx said, they should present all information as quickly as possible. "Door bell ringing now, however, will only deter rather than hasten action."

The types of machines to be bought have already been decided and the most persuasive sales efforts of builders will not alter the decision.

• • •

Navy's share of the $100 million will be $15 million, according to Mr Marx. The Bureau of Ships is to get 18%, the Bureau of Air 39% and the Bureau of Ordnance 43%.

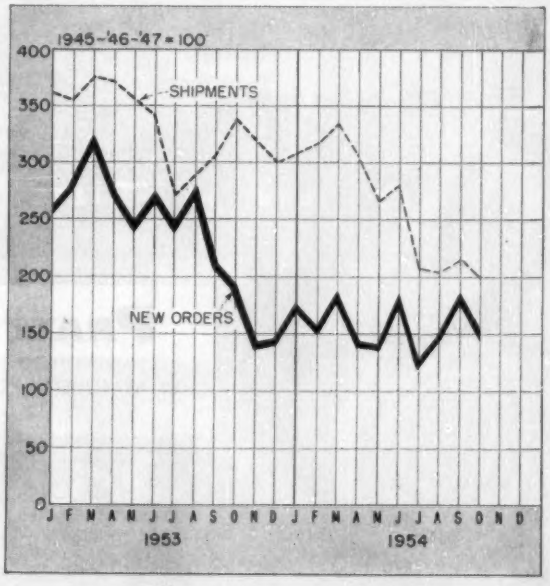
Procurement by these three bureaus will be in accordance with established custom.

Army's portion of the total has been whittled down to a mere $1 million (as against an earlier reported $4 million).

Mr Marx paid tribute to Ralph E Cross, BDSA assistant administrator, for having assisted in steering the $100 million fund for reserve machines to the point where positive action has become a reality.

MACHINE TOOL INDEX
(1945-47 = 100)

(Source, National Machine Tool Builders' Assn.)



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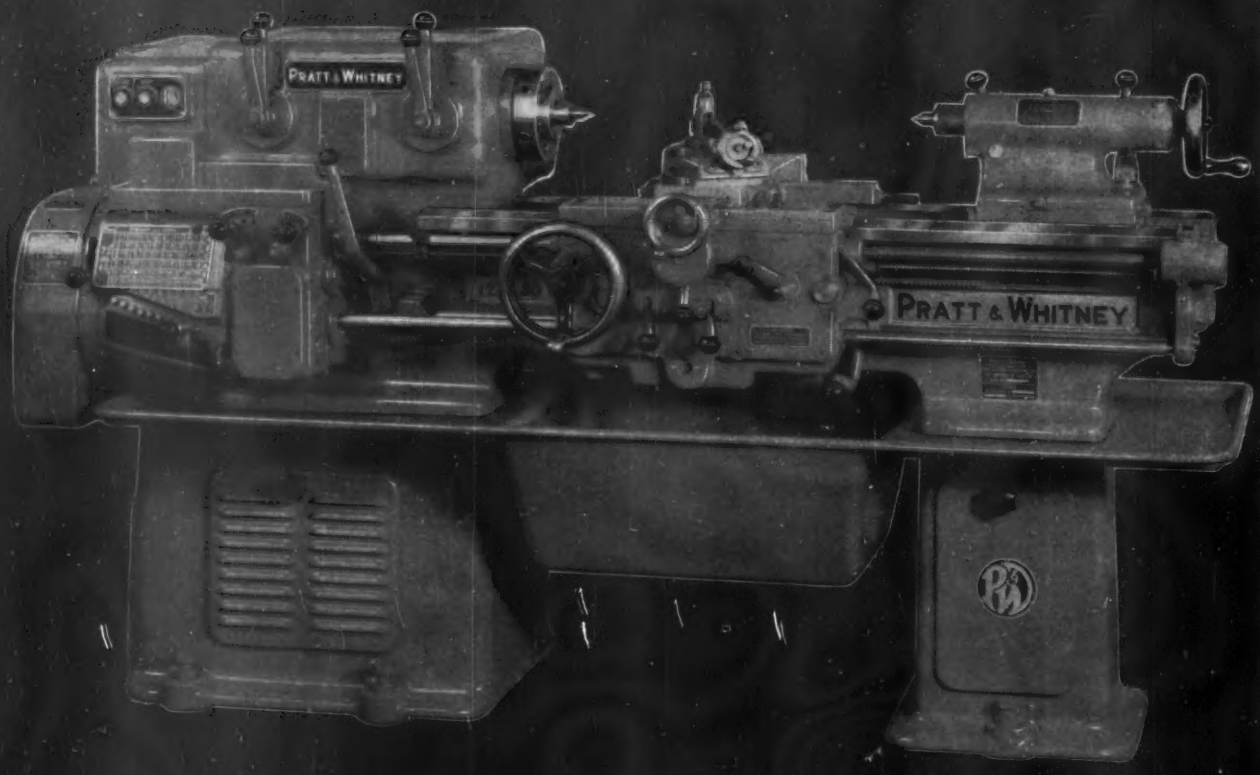
Model "C" Lathes



12" and 16" SIZES IN STANDARD BED LENGTHS

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DIVISION NILES-BEMENT-POND COMPANY
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MODERNIZE with PRATT & WHITNEY REPLACE FOR PROFIT

First Choice P&W *for Accuracy*

Branch Offices—BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Stanco Co.) • DETROIT • HOUSTON • (The Stanco Co.)
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MACHINE TOOLS • CUTTING TOOLS • GAGES

NOW... EVEN BETTER

Wherever "almost as good" isn't good enough, manufacturers throughout industry have traditionally relied on Pratt & Whitney Model "C" Lathes. Finest example of all that Pratt & Whitney stands for, the Model "C" makes it possible to establish and maintain the highest standards of tool room accuracy that are reflected in more efficient, more economical production and in improved product quality.

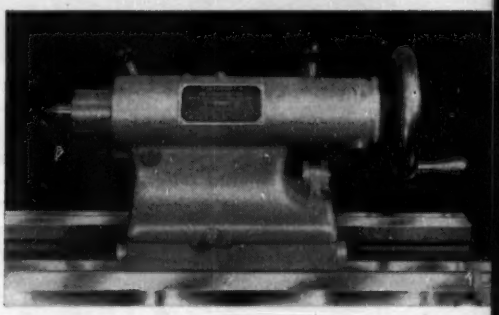
The standard by which all fine lathes are judged, Model "C" Lathes have always incorporated every detail of advanced design, carefully selected materials, skillful manufacture and rigid inspection that can contribute to precision performance and convenient operation.

However, we at Pratt & Whitney believe that even the best can be made better . . . and we are proud to present the *new* Model "C" Lathes. Incorporating many important improvements, as well as a more modern appearance, they offer greater precision and convenience than any previous lathes.

Advanced Features

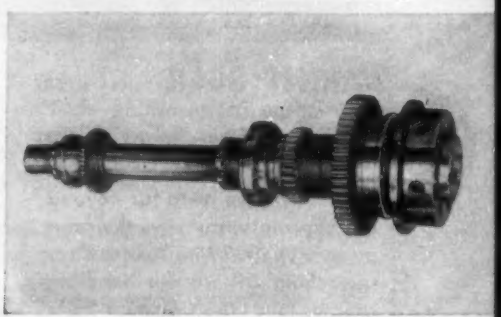
NEW BALL BEARING TAPER ATTACHMENT . . .

eliminates lost motion, backlash and friction. Smooth accurate tapers can be turned or bored even when taking exceptionally heavy cuts. Preloaded ball bearings in the taper bar shoe are mounted on eccentric studs to permit easy adjustment if required. Cross feed screw and all bearing surfaces are hardened and ground to assure long, accurate life.



COMPLETELY REDESIGNED TAILSTOCK . . .

is locked solidly in position on the bed by operating a single lever. This actuates two clamps simultaneously for either normal or very heavy work. New, spring loaded ball bearing mounting, supports nearly all the weight of the tailstock; when the binder is released, very little effort is required to move it on the bed. Spring bronze wipers at both ends of the tailstock base in contact with the bed at all times protect the accurately ground ways.

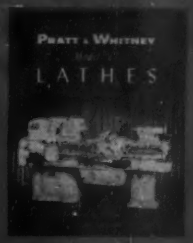


SUPER-PRECISION SPINDLE . . .

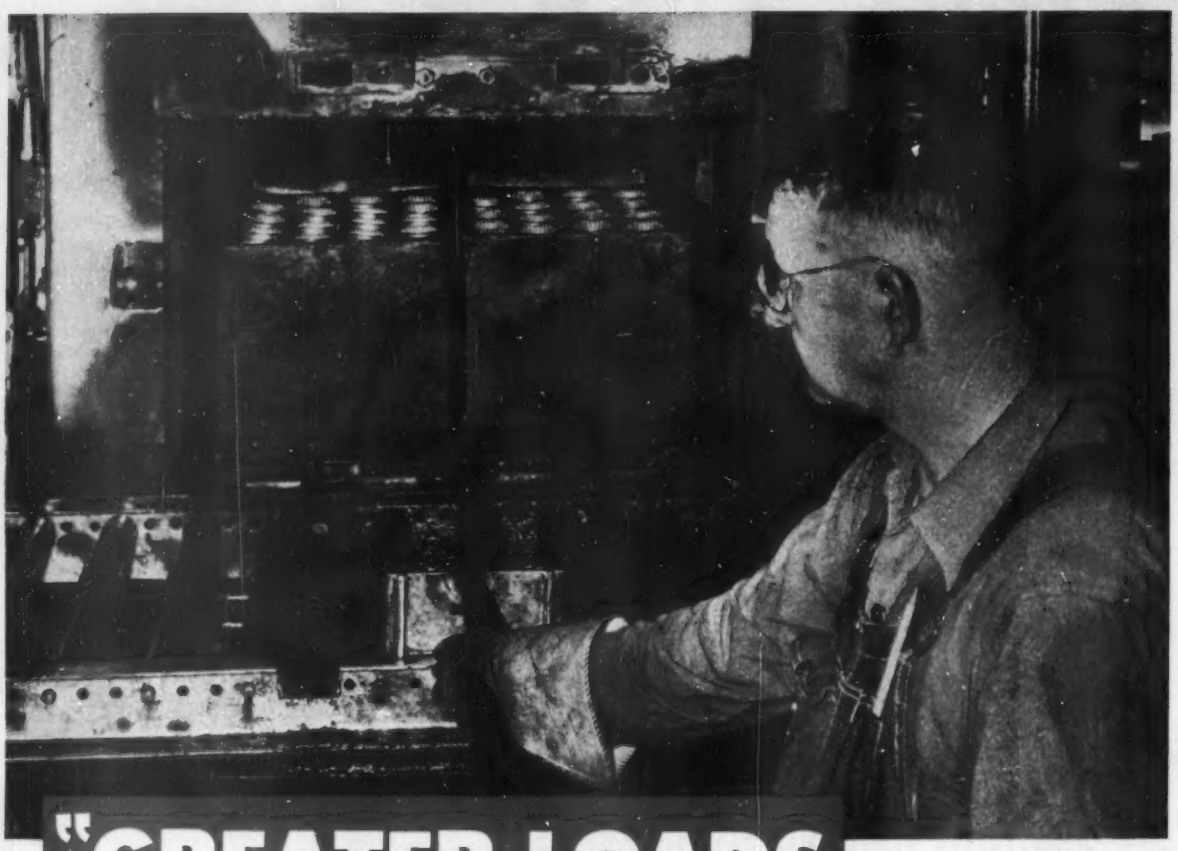
a beautiful piece of precision work. It is hollow to accommodate a draw-back . . . hardened and ground, and mounted at three points. The two front bearings, spaced closely to provide rigid front support, are preloaded super-precision ball bearings. The rear end bearing is of the anti-friction needle type.

HARDENED AND PRECISION GROUND BED WAYS . . .

give longer life with continued accuracy; they meet rigidly high P&W standards for parallelism, flatness, V formation, finish and hardness. The illustration shows a carriage way being tested; total end-to-end error must not exceed .0002" with the straightedge in several positions.



GIVE YOURSELF THE ADVANTAGE . . . EQUIP WITH THE NEWEST AND FINEST . . . send today for complete information on the new, improved Model "C" Lathe. Write on your Company letterhead for your free copy of Circular No. 539-1.



"GREATER LOADS ... MINIMUM DISTORTION"

Warner Gear Division, Borg-Warner Corp., Muncie, Indiana, reports on Texaco Marquenching Oil

WARNER GEAR notes great improvement in quenching results since *Texaco Marquenching Oil* was introduced.

"Results have been far beyond our expectations," says the company's report. "With Texaco Marquenching Oil we are handling greater loads than we ever could with ordinary quenching oils and of greater importance are getting less distortion. We like Texaco Marquenching Oil so much that we are extending its use to our other plants."

Other companies are getting similar results with *Texaco Marquenching Oil.* Users say it assures them the desired microstructure, reduces distortion and gives uniform hardness—all at a lower cost. *Texaco Marquenching Oil* is made especially for this service. It has outstanding oxidation-resistance, is always uniform in quality, and has a high flash point.

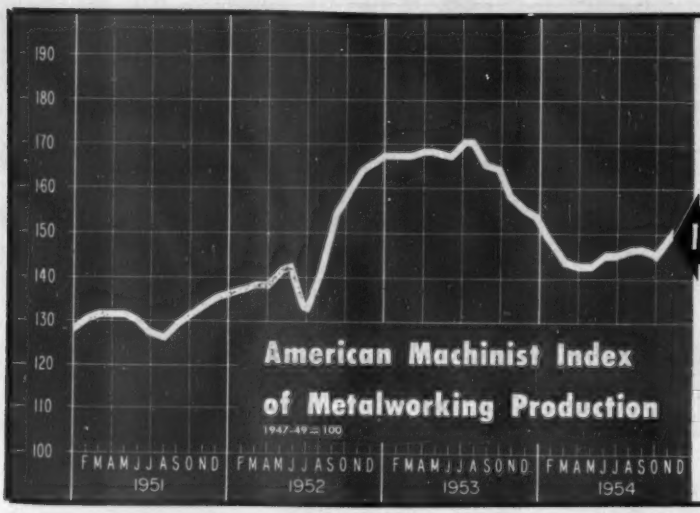
Let a Texaco Lubrication Engineer give you the full story. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO OILS FOR QUENCHING MARQUENCHING AND TEMPERING

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR, on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Gaging Metalworking . . .



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV '54(*)	OCT '54(p)	SEPT '54(r)	OCT '53
Total Index	**150**	**148**	**148**	**165**
Machinery	124	125	141	
Electrical Machinery	195	190	194	
Autos	86	78	122	
Other Transportation	295	310	298	
Other Metalworking	123	124	136	

(*) Estimated (p) preliminary (r) revised

Metalworking operations will come up to the year's end with little change from the rate that has prevailed for a number of weeks.

Production overall has shown remarkable stability through the late summer and fall. And there is little sign of weakness at the beginning of the winter.

The resurgence of automobile manufacture has done much to offset a bit of softening in other directions.

How long Detroit will be able to assemble cars at a near-record volume for this time of year, no one really knows. Schedules for the next few weeks, however, are very heavy, as makers stock dealers with new models.

• • •

The farm equipment situation continues to look better. Inventory in dealers' hands and at factories has gotten down to normal levels. And retail sales have perked up. Output is somewhat higher as a result.

• • •

Management in many segments of Metalworking is being governed pretty much by developments from day to day, or week to week.

Their factory operations are very sensitive to field sales. And many companies are not ready at this point to peg their schedules, even for the first quarter.

General thinking and the sales trend are on the optimistic side, show less evidence in production equipment than elsewhere.

• • •

Steel production outlook is excellent — healthier than it's been in a long, long time. One major steel area reports that the week before Thanksgiving the operating rate was 73.5% of capacity. Thanksgiving week, even making allowances for the holiday, it was 79.7%. At last reports, mills in the area were operating at 80.2% of capacity, and still rising.

Sheet is selling ahead of the field, with capacity for enameling stock sheets booked solid through February. The same holds true for terneplate sheet and galvanized sheet.

Demand for alloy steels has improved materially in recent weeks.

Wire products are reported in "good demand" this month. This is expected to increase to "substantial demand" in January and February.

One firm's operating rate is over 100%, of capacity. Two weeks before Thanksgiving it was 97%, week after that it was 100.5%, and at last report the producer, which hit a low of 80% in August, was at 105.5% and going up fast.

The one weak spot in the steel outlook is railroad products. But carloadings are up, and steel producers are hopeful that the railroads will start buying soon.

• • •

Steel scrap prices have stabilized themselves at about $34-36 per ton—up $8 or so a ton from last summer's low.

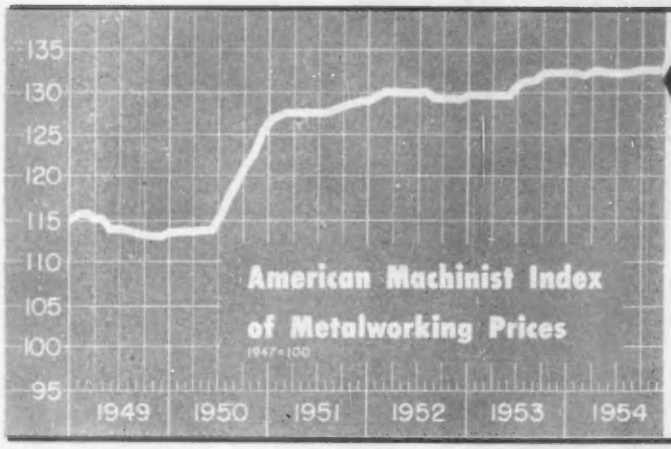
• • •

The appliance people report fast-climbing factory sales since September, with television leading the way. Some TV-set producers are racking up the biggest sales totals in their history.

At the current sales rate, some TV makers expect fourth quarter sales anywhere from 25-30% ahead of fourth quarter last year.

Also going great guns are ranges, refrigerators, dishwashers, garbage disposal units, and washing machines of all kinds.

Gaging Business . . .



PRICE INDEX

	NOV '54(*)	OCT '54(p)	SEPT '54(r)	OCT '53
Total Index	**132.8**	**132.8**	**132.8**	**132.5**
Metalworking Machinery	**142.9**	**142.4**	**141.7**	
Other Machinery exc. Electrical	**137.6**	**137.5**	**137.1**	
Electrical Machinery	**130.7**	**130.7**	**131.7**	
Fabricated Metal Products	**129.2**	**129.2**	**128.9**	

(*) Estimated (p) preliminary (r) revised

1955 business outlook is getting better and better. It now looks like next year may equal — even top — 1953's production records.

While this doesn't mean every company or industry will do as well as it did in 1953 (one reason: there are a lot more companies around to compete for the consumer dollar), in terms of total national product, industrial output and personal income, '55 will be 'way ahead of '54.

Gross National Product should reach $365 billion by the middle of next year, compared with $356 billion in mid-'54.

Federal Reserve Index of Industrial Production should pass 130 (1947-1949 = 100). This Index is averaging about 124 for 1954.

Personal income (currently running at about $287 billion) should rise to $292 billion in '55.

• • •

It now seems clear that 1954's recession, readjustment or whatever you call it, is well behind us. Key to this is the industrial output turn-up that started in October.

Reason for this is the return to high levels of steel and automobile production. And construction is piling a new boom on top of the old.

• • •

An idea of what can be expected in consumer buying is given in a new U of Mich survey, which indicates consumers are in a mood to buy and will increase spending in the next six months.

More families intend to buy new cars, new homes and appliances than was the case a year ago.

If November department store sales are an indication, the upcoming Christmas shopping spree will be the biggest in history.

• • •

On the less-expansionist side, there is a good chance of further declines in federal spending — particularly for military hard goods and construction items.

And there is also a chance of a further drop in purchases of machinery by both business firms and farmers. But in both cases, the worst of the decline is already over.

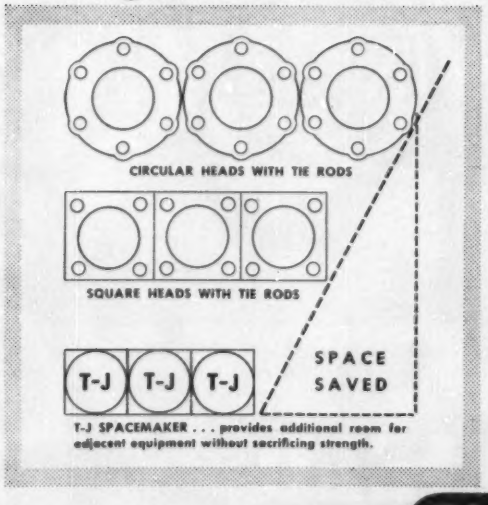
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	130.7	129.5	126.6
Steel ingot operation (thousands of tons)	1,890	1,892	1,956
Electric power output (million Kilowatt hours)	9,317	9,197	8,416
Production of automobiles and trucks	159,931	141,154	108,729
Engineering construction awards (*Eng. News-Record*—millions)	254.2	301.8	145.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949 = 100)*	125	124r	132
Index of durable manufactures production (1947-1949 = 100)*	138	136	151
Durable goods manufacturers' sales, millions*	$10,974	$10,952	$12,698
Electrical machinery manufacturers' sales, millions*	1,336	1,276	1,536
Other machinery manufacturers' sales, millions*	1,868	1,838	2,163
Durable goods manufacturers' new orders, millions	11,341	9,978	10,110
Electrical machinery manufacturers' new orders, millions	1,256	1,009	1,082
General machinery manufacturers' new orders, millions	1,770	1,655	1,843

* Seasonally adjusted



T-J Spacemaker CYLINDERS

OIL pressure to 750 — AIR to 200 P. S. I.

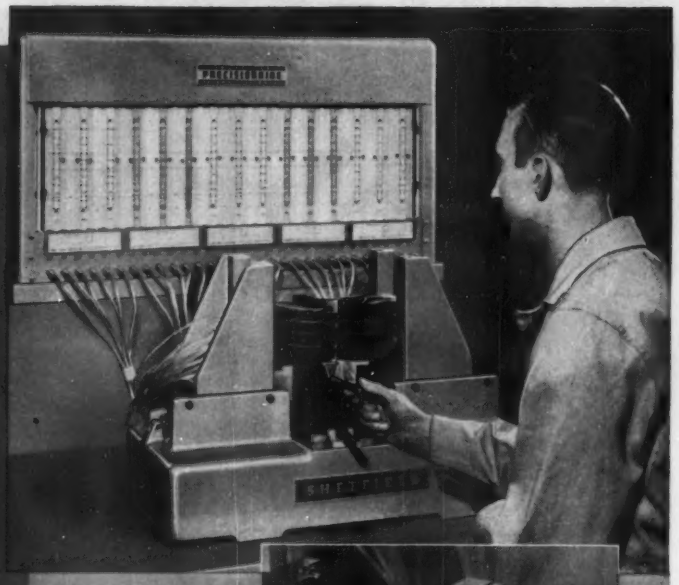
Now the sensational new T-J Spacemaker sets the pace in compact cylinder design and efficient performance!

New "Self-Aligning" adjustable oil cushion means faster acceleration and better cushion than ever before . . . New T-J Super Cushion Flexible Seals for air insure positive cushion with automatic valve action for fast return stroke.

More plus features include—heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, high-tensile, *hard chrome plated piston rod.* Write for bulletin SM-454-2. The Tomkins-Johnson Co., Jackson, Mich.

T-J **TOMKINS-JOHNSON**
RIVETORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

YOU CAN GAGE 40 or MORE DIMENSIONS *As Quickly* AS YOU CAN ONE



Checking 30 points on a jet engine blade

Gaging heads ready to approach the jet engine blade

Spectacular developments in AIR gaging are saving industry millions of dollars and thousands of man-hours. Here's how and why:

1. One operator with one gage can check up to 40 or more dimensions of each work part simultaneously and instantly. The number of parts per hour depends solely on how fast the inspector can handle them.

2. Precision is built into the gage—readings are unaffected by human skill, human judgment and human memory. It's not necessary to memorize and compare readings for individual dimensions—one quick panoramic glance at the float pattern ("Airechart") tells the whole story—the "Float Graph" shows the true condition of every critical dimension.

3. The position of each float shows just where the dimension is within tolerance limits or just how much above or below limit if it is out of tolerance. This is essential for Quality Control.

PHONE, WIRE or WRITE for the full story on how YOU can "produce more and better products at lower cost through practical precision"—in this case, multiple dimension inspection by Precisionaire gaging.

Gage Division — The Sheffield Corporation
Dayton 1, Ohio, U. S. A.

All main bearings of a tractor crankshaft are checked simultaneously

6757

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Better think it over, Mr Reuther!

Walter Reuther has taken, on behalf of his automobile workers' union, an untenable position on automation. He seems to regard it as a necessary evil that cannot successfully be suppressed but should be kept under strict control.

He demands that workers be paid a special premium for so-called automated jobs. The problem of determining new classifications and wage rates for automated work is to be left to the union locals and management. Impartial arbitrators are not to have a hand in the matter.

Since automated operations require less manpower, Mr Reuther would tie in automation to the business cycle. Installation of automated equipment would be made only in good times, when other jobs are available for displaced employees.

Mr Reuther is proposing an appalling program that would stifle attempts at cutting production costs. Automobile companies, traditionally pioneers in new manufacturing techniques, would be hamstrung in efforts to mechanize their processes. Car makers would be subject to a union veto on any proposed installation that might be called "automated."

Has Mr Reuther thought about the devastating effects of his program upon the basic machine-tool and production-equipment industries, or doesn't he care? New machinery is to be bought only in good times, not in bad. That means that machinery builders are to be flooded with work in prosperous periods and are to close up shop in a recession. That kind of action would be fatal to an industry, already too cyclical, that is essential to our national defense and to our peace-time economy. It would completely disregard the welfare and impair the job stability of tens of thousands of workers in that industry.

Mr Reuther, in advocating special compensation for workers on automated jobs, gives the impression that employees are not benefitting from the savings made through mechanization. Has he forgotten the "annual improvement factor" of four or five cents an hour that automobile workers in general have been receiving since 1951? That amount is on top of the regular hourly rate, and whether designated as such or not represents a share of any manufacturing economies resulting from technological advancement.

To go beyond the "annual improvement factor," we wonder where Mr Reuther thinks the money comes from to pay workers a constantly mounting hourly rate, year by year? It cannot possibly originate anywhere except in the higher production per worker resulting from his greater use of mechanical power.

Yes, Mr Reuther's position is untenable. He wants to turn on the faucet of technological advancement when he feels like it and turn it off too at will. If that theory had been put into practice through the years, automobile workers would not own their own homes, ride around in cars, sit comfortably in their living rooms and view television, and enjoy hundreds of conveniences of everyday living as they do.

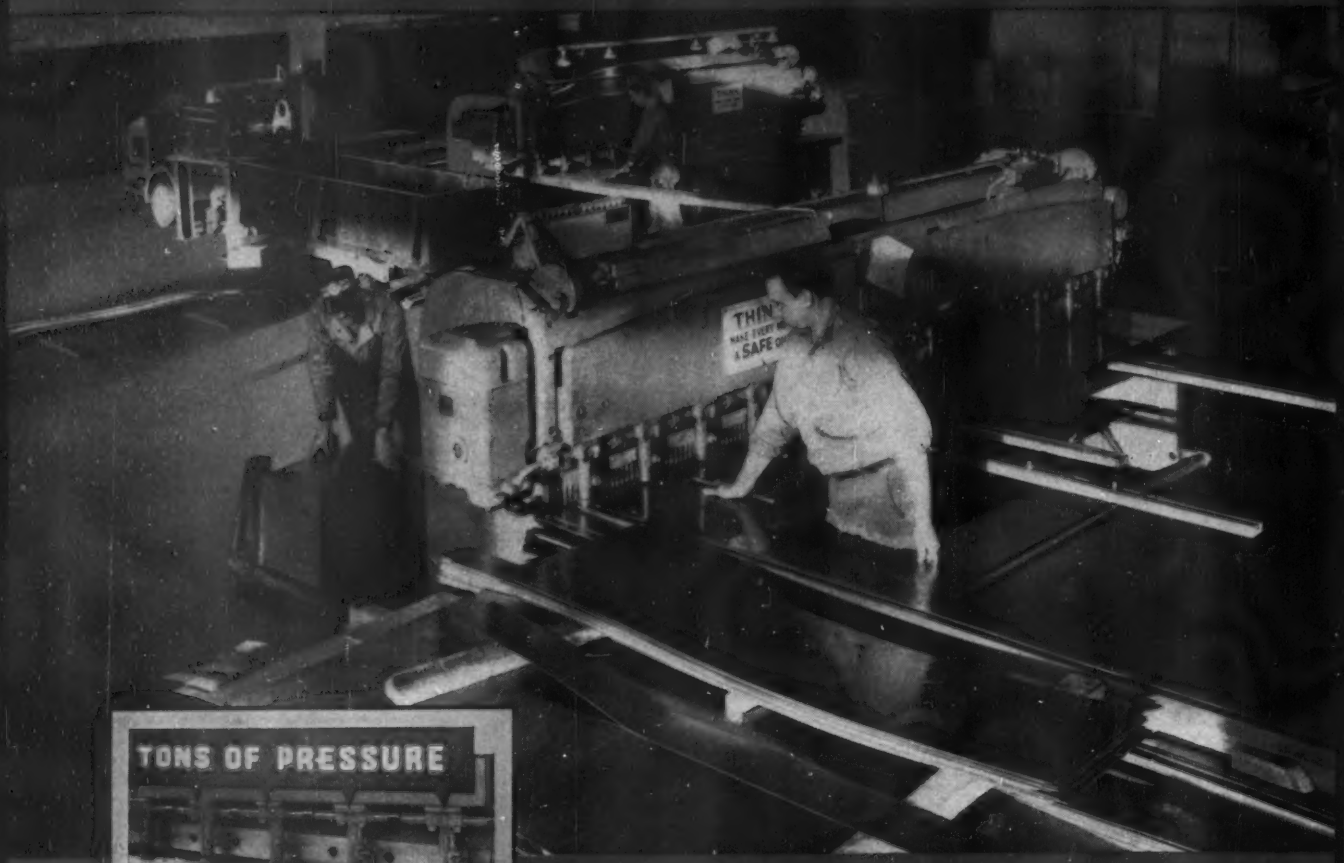
Perhaps it might be well for Mr Reuther to brush up on the principles to which he agreed in 1951 in signing a union contract with General Motors. At that time the UAW recognized management's sole responsibility for maintaining worker efficiency.

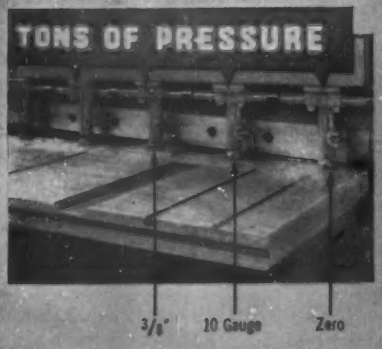
It recognized further that "improvement in the standard of living of employees depends on technological progress, better tools, methods, processes and equipment, and a cooperative attitude on the part of all parties to such progress." It also recognized "the principle that to produce more with the same amount of human effort is a sound economic and social objective."

These principles are as sound today as in 1951. We urge Mr Reuther to stick to them.

Burnham Finney

ACCURACY is necessary





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Photos courtesy The W. J. Holliday Company, Inc., Indianapolis, Indiana

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American Machinist

Do you, as a {BOSS / WORKER} sometimes have trouble getting your {MEN / BOSS} to understand what you're trying to explain? Are your ideas just not getting across? Maybe the fault isn't with either of you, but lies in the difference in the ways your minds work. Perhaps you should seek the answer to this question:

Are you a visual or a verbal man?

J J JEHRING, director, PROFIT-SHARING RESEARCH FOUNDATION, EVANSTON, ILL

"What's wrong with me? Why can't I get him to understand my side of the question? Is he just being stubborn, or is there something I could do to make myself clear to him?"

Have you, as a manager, ever asked yourself these questions? Has it ever seemed to you that there's some kind of wall between you and the men around you?

I believe there is such a wall, that lies deep in the minds of men, that explains a lot of the misunderstanding (and complete lack of understanding) between men.

Here is the explanation: A man is either visual or verbal. Some are born that way; others get that way because of their environment.

A visual man "learns by looking." To study a diesel engine, for example, he would like to watch it work, take it apart and put it back together, and, perhaps with an instructor's help, figure it out from seeing it. Most of what he knows has been picked up the same way—how people behave, how to run a machine, what's wrong with the world, and so on. For the visual man, words are just something to identify things, not something to be manipulated in abstract conversation. Some words annoy him, especially when they refer to non-concrete ideas.

Because the relationships in his mind are those of concrete things, which are more or less direct, and certain, the visual man's ideas are likely to

be fairly firmly fixed. He's used to getting things "pegged," and keeping them that way.

A verbal man is the traditional student. He learns special words and other symbols to express his thoughts. He "learns by study"; he may carry this so far that his symbols get too complicated to be understood by anyone but another specialist in his own field. He is one of the group of men who are likely to develop new social and physical concepts, which must somehow be made useful to the larger number of visual men.

The verbal man's ideas are less likely to be firmly fixed. Most of the time symbols can only approximately describe a physical object. ("A picture's worth ten thousand words.") So the verbal man's symbol-oriented ideas must leave more room for change than the ideas of picture-oriented visual men.

Here's one often-quoted example (see *AM* — Mar 15, '54, p177) which shows how the confusion can start, and how it can be eliminated:

A plumber wrote to a government bureau that he'd found hydrochloric acid opens plugged pipes quickly, and asked whether it is good thing to use. Wrote a bureau scientist:

The uncertain reactive processes of hydrochloric acid place pipe in jeopardy when alkalinity is involved. The efficacy of this solution is indisputable, but the corrosive residue is incompatible with metallic permanence.

The plumber wrote back, thanking the bureau for telling him his method was all right. The scientist was disturbed about the misunderstanding, and showed the correspondence to his boss — another scientist — who immediately wrote this letter to the plumber:

Hydrochloric acid generates a toxic and noxious residue which will produce submuriate invalidating reactions. Consequently, some alternative procedure is preferable.

The plumber wrote back that he agreed with the bureau — hydrochloric acid works just fine. Greatly disturbed, the two scientists took their problem to the top boss. The next day the plumber received this telegram:

Don't use hydrochloric acid. It eats hell out of the pipes.

HOW IT ALL STARTS

Both visual and verbal thinking begin long before school age. Children start to build up a warehouse of visual and verbal images. The baby sees a dog, and the parent says the word "dog." Soon the baby says "dog," and another verbal-visual symbol has been learned.

In elementary school, where it is impractical to bring steam shovels and the Taj Mahal into the classroom, students learn mostly from books (although a lot is being done to use pictures and other aids to understanding). Especially in such courses as history and mathematics, more and more time is spent symbol-connecting, as opposed to thing-connecting.

At some point in this process of learning, some students begin having trouble making the symbols go together. These are the children who are destined to become visual men. On the basis of aptitude tests, the verbals and visuals are separated. Verbals go into academic programs, while visuals either study vocational subjects, stay in the academic program and become misfits, or quit school and get a job.

From this time, the education of these groups becomes very different. The visual student learns "from experience," and about 80% of experience is visual. The instructor shows the student the things he will later need to know, and the visual student steadily grows in understanding of the physical relationships between things he can see, feel, connect up and disconnect, and so on.

As the visual man grows older, he relies less and less on symbols. His reading is mostly an occasional newspaper (tabloid variety preferred) and picture magazines. He sees a lot of television (who doesn't nowadays?) but shies away from programs too heavily laden with symbolic content. His conversation is usually with other visual men, which tends to demand only a limited vocabulary.

WHAT ABOUT "IQ"?

This doesn't mean at all that the visual man is "dumb." He may have gone to college, and he can be just as "smart" as the verbal man, but his understanding is of physical things, rather than abstractions. He gets information from observation, and likes it that way.

The verbal man has taken the academic course in high school, and he continues to learn more and more complex verbal and mathematical symbols.

He often goes to college, and occasionally to graduate school, where the business of symbol-connecting gets more complicated and remote. His thoughts are usually so specialized that he may have trouble in exchanging ideas with anyone but someone with the same professional background as his.

This split in the social personality, with by far the larger number of people "visuals," leads to

serious misunderstandings between verbal and visual men. If the verbal man wants to get his ideas across to the visual man, *he must find some way to do so on the visual man's terms,* because that's the only way the message will "come across," and be accepted and acceptable.

The verbal man can try to force his words on the visual man, but it doesn't do any good. The visual man has neither time nor inclination to read, and, even if he did, a constant stream of words is confusing. There are too many symbols.

This doesn't mean that there is something "wrong" with the way the visual man's mind works. One of the dangers of complex "verbalization" is that the symbols get so far away from actuality and yet so internally consistent (like a dictionary, which is a very large book of internally consistent symbolizations) that the symbols lose their relation to the physical world. At times like that, a good dose of the visual man's thing-orientation would help get things in perspective. The visual man is often much better adjusted to his surroundings, which puts him at an advantage in adapting to his environment.

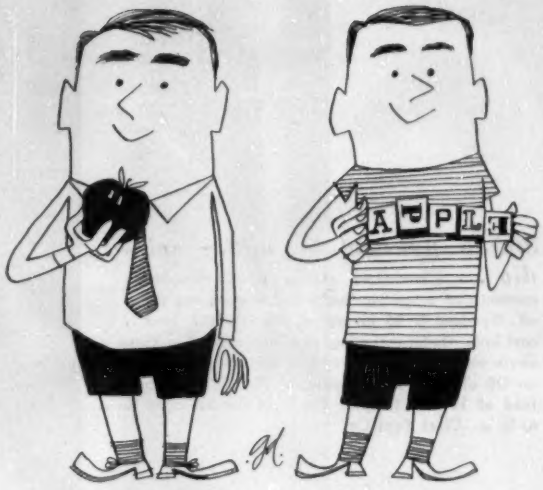
MORE PROBLEMS CREATED

Another problem this split personality creates is the barrier between the minds of "management" and the minds of "labor." The labor force is largely made up of visual men, while the greater number of management men are "verbal-minded," as we use the term here. That doesn't mean that managers who have come up through the ranks of labor are "visual," or that they *must* have gone to college.

It only means that they have the capacity to manipulate symbols comfortably in their minds. This must be so, because that is their job. Day after day they must make decisions, plans, forecasts, all on the basis of symbols, such as a product schedule, balance sheet, inventory list, and the like. They may never see some of the things they work with; in fact, some of the things they use as tools don't even exist at all, except in the minds of men. Examples are balance sheet ratios (you can't put a ratio on a cart and carry it around; it's just an idea), estimated markets, and potential sales figures.

However, they manipulate these symbols to arrive at relationships from which decisions can be made. As the typical management man repeats this process, he accepts symbol-manipulation as a matter of habit. Then, when he has something to say to his workers, he tries to convey his message in verbal terms. When nothing happens, he is upset, and often blames the men for being obstinate and refusing to accept his words. *The truth of the matter may be that they never knew what he was saying, because the method of presenting the message didn't take into account the basic difference in thinking habits.*

This situation is particularly true if the problem has something to do with intangibles like loyalty, economics, responsibility, or any of a lot of other "verbal" ideas. We may know what the concept of loyalty is, for example, and we could surely give



VISUAL . . . OR . . . VERBAL?

examples of it, but has anyone ever held loyalty in his hands? Can you put it on a truck and carry it around? (I don't mean the kind of loyalty you get with a sawed-off shotgun.)

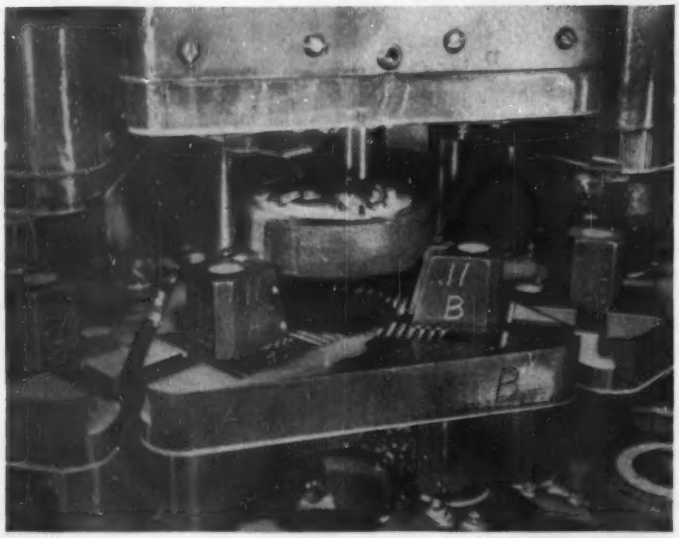
Of course not. That's what makes it hard for a verbal man to talk to a visual man about the *idea* of loyalty. (It also makes a lot of talk about loyalty meaningless, because it is buried too deeply in symbols, with not enough thing-meaning.) This doesn't at all mean that the visual man tends to be disloyal. The opposite is more often true. It's just that he wouldn't talk about the *idea*. He'd be more likely to just go ahead and *be* loyal. (If he had to talk about it, he'd probably say something like, "Well, if you give them a break, they'll give you one when you need it.")

WATCH OUT FOR THIS, THOUGH

Having said all this, let's add the complications that go along with the explanation. First of all, there's no such thing as the completely verbal man or the completely visual man. Personal traits don't work that way, any more than anyone is *completely* unselfish or *completely* selfish. All of us have both visual and verbal characteristics in varying degrees. The good that may come from knowing about the principles here is that people are usually more visual than verbal, or vice versa. That means they act, understand, and think more or less like the "ideal" visual or verbal man we have described, and we should make allowances for the fact (in ourselves, as well as in others).

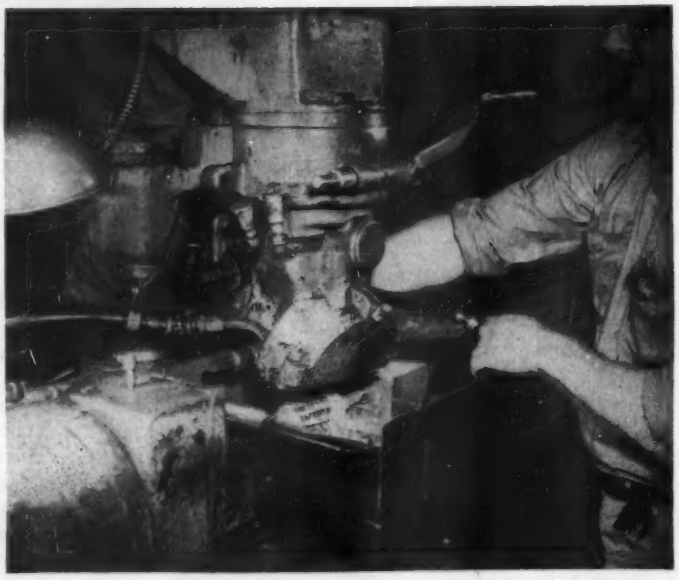
Also, and this is quite important, there is nothing inherently "good" or "bad" in being either visual or verbal. Both kinds of people are absolutely necessary to each other, rendering valuable services that neither could do alone. Verbal and visual are simply descriptive traits, given you in the hope that understanding what we've said here may help take some of the "bumps out of the road" of effective management and effective production.

800-lb flywheel on miller spindle . . . minimizes chatter when thin-section transmission cases for trucks and tractors are faced off. Flywheel is 35 in. across, 3½ in. thick, and is cast iron. Cutter-mounting face is hardened to keep down wear. Cutter uses carbide bits, and may have an OD of 18 to 22 in., speed of 32 to 60 rpm, and feed of 10½ to 13 ipm. Depth of cut averages ⅛ to ⅜ in. *Clark Eqpt Co*



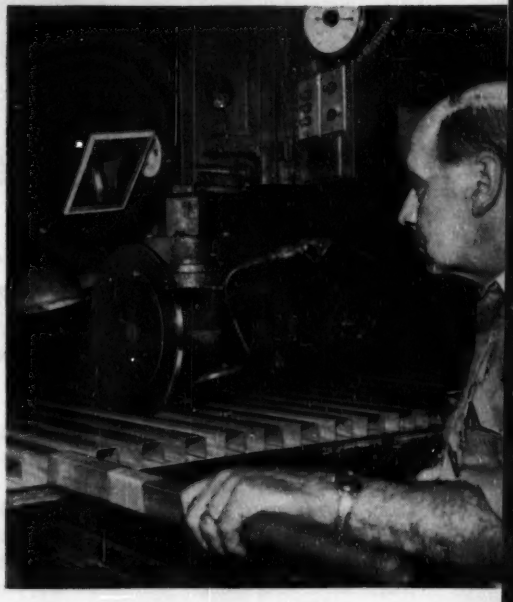
SHOP SHOTS

Adjustable jaws hold gear forgings while they are core-drilled in multi-station Davis & Thompson Roto-Matic drilling machines. Triangular plate with straight grooves is fixture base; three wedge blocks fit on this, supporting serrated and hardened tool-steel inserts that grip the work. Spring-loaded pressure pads (just under head) on top fixture come down to clamp the forgings firmly as core drill descends and retracts. Fixtures can be adjusted for gear blanks with OD's from 2 to 8 in. Machines have 8 or 12 spindles. *Clark Eqpt Co*

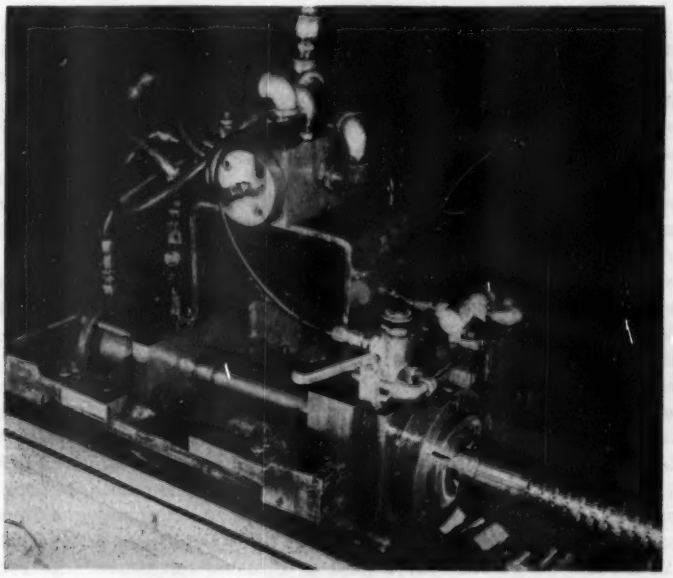


Wet hob grinding . . . is a new feature on several old grinders. Entire length of gear hob is flooded by flattened end of discharge nozzle that pours out 40-to-1 soluble oil. Splash guards were mounted on machines, and Gray-Mills coolant sump units with 1-gpm pumps and feed lines were added to the setups. Sharpening conditions have also been improved by addition of tailstocks that help support hobs between centers. *Clark Eqpt Co (Transmission Div), Jackson, Mich*

Overhead tack-welding unit . . . replaces two Heliarc machines in duct-assembly area where stainless-steel flanges must be welded. Machine has two long flexible leads on messenger wires, allowing the two guns to reach anywhere in the 20x60-ft area for working on from 16 to 24 welding jigs. *Boeing Airplane Co*



Mirror on rollweld spotwelder . . . saves $15,552 a year on these floor-panel parts alone. Operator can see both ends of work from where he stands, so he doesn't overshoot spotweld strip. This cuts down rejects, reduces strain from neck craning, and reduces number of manual tack welds by a third. Mirror is at 45°. *Boeing Airplane Co, Seattle, Wash*



Air-powered draw collets . . . clamp horizontal broaches at the follow rests of machines adapted to save operator effort. Normally, operators at these machines require considerable strength to snap broaches in and out of conventional chucks with spring detents. Now, four-way air valve that controls air cylinder is operated by button valves at slide handle and behind follow rest, where stop pins are located. *Clark Eqpt Co*

300 TOOLING IDEAS, based on recorded experience from previous jobs, are filed in one small drawer. Simple photo technique makes it easy for anyone in the shop to take pictures and maintain file but job should be limited to one or two men, for control. Note on back of each photo gives pertinent details. (Ed note: Polaroid attachment is available for Speed Graphic cameras, where one of these is on hand)

EXPERIENCE FILE...*Pennies for photos save*

Here is an effective tool in any shop cost-reduction program. While many people keep a record of the tricks, techniques, and special methods devised to solve knotty problems, this practice can be costly and time-consuming; yet it is too valuable to discontinue.
This article describes a more efficient system, built around a Polaroid "Land" camera, for recording know-how

HARRY J FRIEDMAN, foreman, WHEELER SERVICE, CAMBRIDGE 39, MASS.

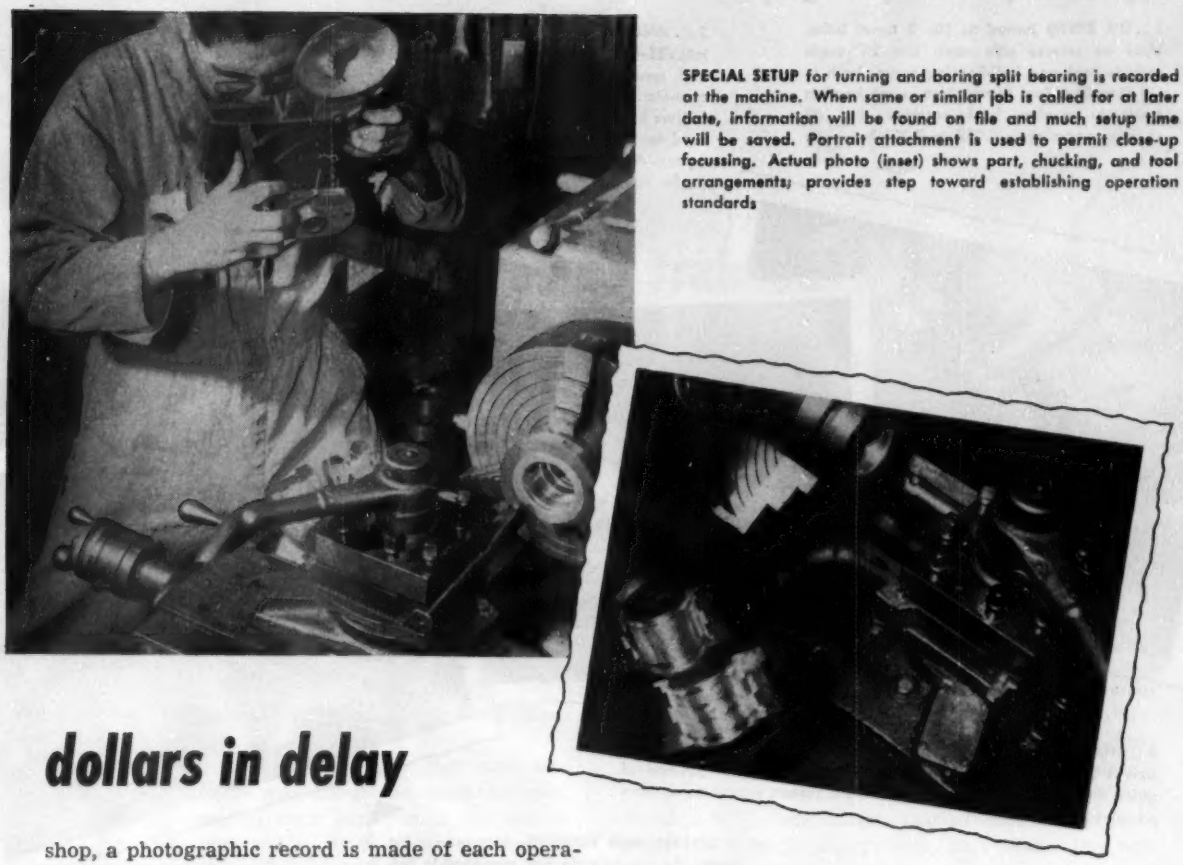
Like so many of the smaller shops, we were constantly plagued with the problem of making fast and accurate records of machine tool set-ups and of the tools used. Formerly, we spent an hour or more making a sketch, and then laboriously described all of the tools used and "what went where," so that six months later a machine tool operator could understand the principles and tooling. In some cases we couldn't take the time to make good drawings.

Eighteen months ago I approached management with the idea of photographing tooling setups. They were skeptical but willing to test it in practice. Today, with more than 300 photographs in our shop file, management is 100% convinced of the camera's value to the entire organization. As the Boss puts it, "We do not all get the same understanding from a technical description, but a photograph tells the same story to all."

The camera that we are using in this program is a Polaroid "Land" Camera-Model 95. Basically, the difference between this camera and all other cameras is: *one minute* after you have taken the picture, you have the finished print in your hand. There is no fuss with waiting for development, chemicals, etc, and the photographer need not be expert. If the photograph is not satisfactory, you immediately can correct and take another. Here you have completed the basic step in record keeping, then with a few written notes on the back of the photograph the permanent record is completed.

Any machine-tool setups where the operators find the exact nature of the tooling arrangement difficult to remember are photographed on the job after the operator has finally completed a successful setup. Thereby, we not only record this setup for the future use of that operator, but we also show by the photograph how the setup must look from then on. We are standardizing our machine-tool setups, which is important timewise, as so many of the operators ordinarily set up the same job on the same machine differently.

Whenever a new or unusual job comes into our



SPECIAL SETUP for turning and boring split bearing is recorded at the machine. When same or similar job is called for at later date, information will be found on file and much setup time will be saved. Portrait attachment is used to permit close-up focussing. Actual photo (inset) shows part, chucking, and tool arrangements; provides step toward establishing operation standards

dollars in delay

shop, a photographic record is made of each operation that varies from our regular machining operations. Thus, with all of the operational prints before us, we are able to intelligently discuss the finished product in the office. This pictorial record of each operation has eliminated considerable misunderstanding as to how setups were made, whether the office is trying to verify costs or the machine operator is trying to duplicate his setup many months later.

Photographs are stored in the tool room. Part numbers are marked on the corner of each photograph, then the pictures are placed in individual celluloid jackets so that they stay clean. All photographs are kept in an operational file drawer readily accessible to the men in the shop. A cross-index system enables the shop men to find any needed photograph within a few moments. These photographs are kept in the tool room, and not in the office, so that the men will feel free to use them when information is needed, without fear of office "red tape." Many times the shop man wants a photograph of an operation that "was like the one that I am now doing." He goes to the file drawer, finds it, and we have reduced our setup costs.

With the aid of psychology, rather than managerial force, we have been able to photograph the "trick methods" that many of our skilled operators have used on their work, thereby making these "tricks" available to our less experienced men. We have discovered that, with the aid of photographs, we can really increase new operator confidence. The latter feels that he actually has the skilled machinist showing him how to make the setup, without being self-conscious or nervous as would be the case if this same skilled machinist was standing over him. This technique can also be used to minimize some of the work of setup men. We have eliminated the need for two men on many machine tool setups.

Other applications for which we have used our camera are:

1..Recently, in our tool grinding department, one of our key men reported sick and we were unable to duplicate his special tool-sharpening setup. Now, with the aid of photographs, we have a pictorial record of all unusual grinder setups for the sharpening of our cutting tools.

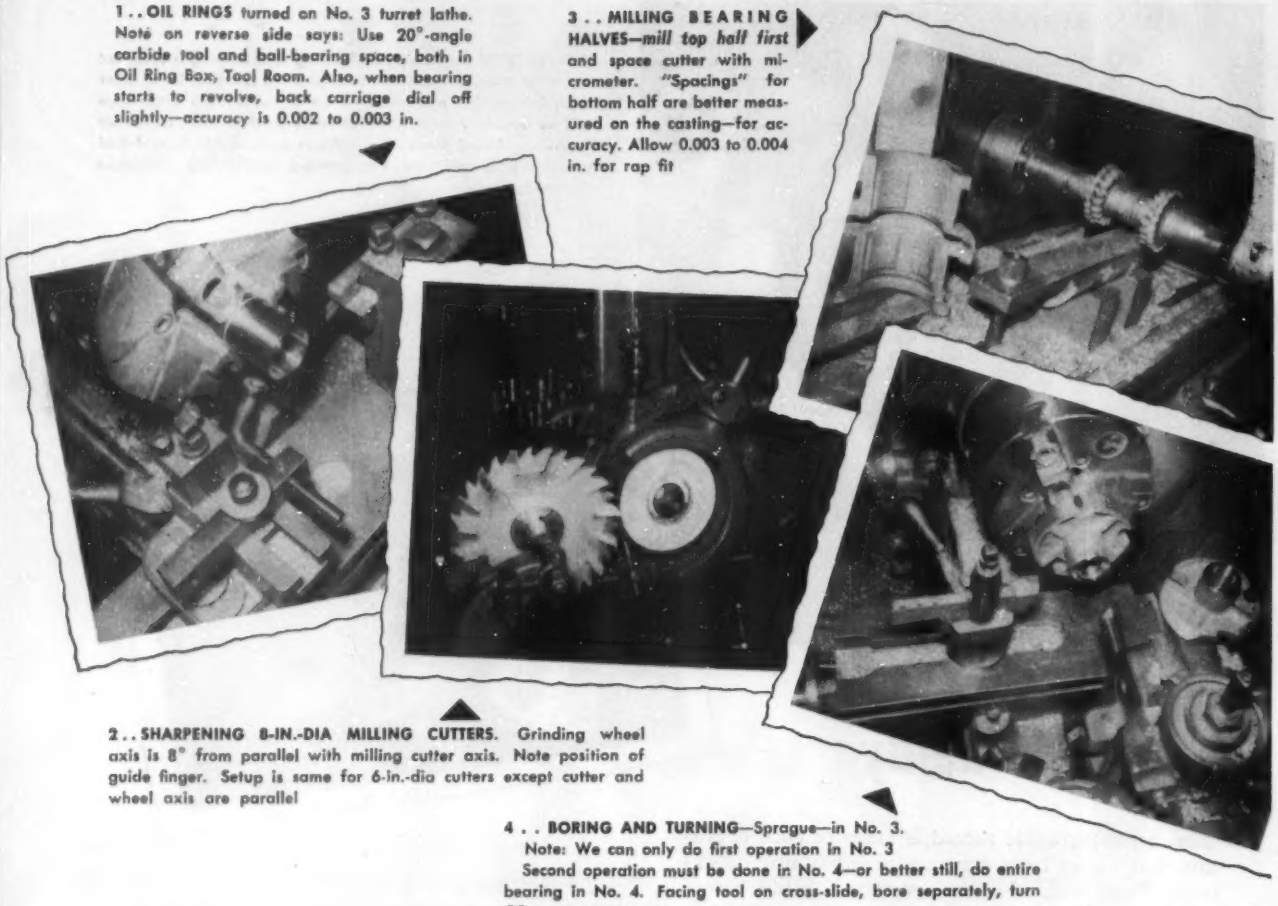
2..When a safety inspector shows us a faulty condition we immediately take a picture of the hazard, and keep this as a visual desk reminder until the condition is corrected. Then, we take another picture of the corrected condition and both photographs, along with the inspector's report, are filed.

3..The Polaroid camera is invaluable in our maintenance records, especially when a machine tool requires new parts and we do not have a manufacturer's machine-parts list. We simply send a photograph of the broken part, and a photograph to show the location of the damaged part in the machine. Many times in the past our descriptions on

Typical shop-record photographs

1..OIL RINGS turned on No. 3 turret lathe. Note on reverse side says: Use 20°-angle carbide tool and ball-bearing space, both in Oil Ring Box, Tool Room. Also, when bearing starts to revolve, back carriage dial off slightly—accuracy is 0.002 to 0.003 in.

3..MILLING BEARING HALVES—*mill top half first* and space cutter with micrometer. "Spacings" for bottom half are better measured on the casting—for accuracy. Allow 0.003 to 0.004 in. for rap fit



2..SHARPENING 8-IN.-DIA MILLING CUTTERS. Grinding wheel axis is 8° from parallel with milling cutter axis. Note position of guide finger. Setup is same for 6-in.-dia cutters except cutter and wheel axis are parallel

4..BORING AND TURNING—Sprague—in No. 3. Note: We can only do first operation in No. 3 Second operation must be done in No. 4—or better still, do entire bearing in No. 4. Facing tool on cross-slide, bore separately, turn OD as separate cut

the purchase order created considerable confusion as to just what we actually wanted to replace.

We also have in our maintenance file section of the drawer, "exploded views" showing the disassembly of our more complex equipment. Hence, when we are ready to reassemble these machine tools, there is no doubt as to the exact placement of the parts in the mechanisms. We also have recorded poor maintenance practices with our camera, thereby being able to standardize maintenance procedures for our machine tools.

4.. Countless times we have received shipments damaged in transit. To justify our claim to the shipper, we immediately take a picture of the damaged shipment as it is received. Then a duplicate copy of the photograph is forwarded with our correspondence. Photographs of special "crating jobs" are made before a shipment leaves our plant. We file these pictures to substantiate our statement that we have packed these special units in the proper manner, should any question arise either by our management or from our customers.

5.. Photographs of all finished "special jobs" are placed in the office for the education of the office staff, enabling them to better understand the company's product. *Too often an item is just a number to an office employee.* Photos make our problems real.

6.. We have developed a pictorial series of "Do's and Dont's of Safety," which are posted conspicuously at each machine. Periodic reminding, in conjunction with the photographs, has helped our safety program.

Other applications for a camera in your plant include legal records and patents, photomicrographs in research, and illustrations for technical reports.

Here are a few practical rules that the photographer should observe when using his camera in the shop (The photographer should be one of your own shop men, educated in the camera techniques):

1.. Handle your camera in the same manner you would handle any other expensive precision tool. Avoid taking pictures of the "boys," as this lowers your prestige and destroys the original purpose for which the camera was purchased. *This camera is a tool.*

2.. Whenever you are taking pictures in the plant be entirely business-like. You are not doing this to amuse the men, but for a specific purpose.

3.. You will know that you have attained the cooperation and the enthusiasm of your men when they ask you to take a picture of a "special job" they are machining.

It's not enough to train foremen...
You must go on to see the training
put into practice if you want to...

Get returns from foreman training

GEORGE S ODIORNE, associate extension specialist, RUTGERS UNIVERSITY, NEW BRUNSWICK, N J

"My boys need a course that will make them use what they already know."

This remark was made by a training director of a medium-sized company in the East. His training program was well rounded and contained all of the regular courses offered by the typical training department. The foremen had been trained in elements of foremanship, human relations, safety, job-methods training, and job instruction. They knew materials handling, labor relations, statistical quality control, and numerous other subjects.

The difficulty was that you'd never know from visiting the shop.

The accident rate and number of grievances was high, the production was about the same as ever, and no improvements over last year's method of operation were observable. It took just as long to teach a new man his job, and the spoilage figures were only a little better than before.

If they knew the answers, why didn't they use them?

This is one of the toughest hurdles for a foreman-training program to cross. It means bringing the classroom, lecture and discussion type knowledge into actual "do-it-now" action. There are several distinct steps which a shop manager can take:

1. **Start by Conducting Good Training:** Find out what is really needed before training at all. Plan it carefully, make a timetable, use the latest method of instruction or conference, and show the student-foreman the top management is behind the program and wants it to succeed. An interesting, well-presented program stands a better chance of sticking with the men than one which is all lecture, where the instructor is poorly prepared.

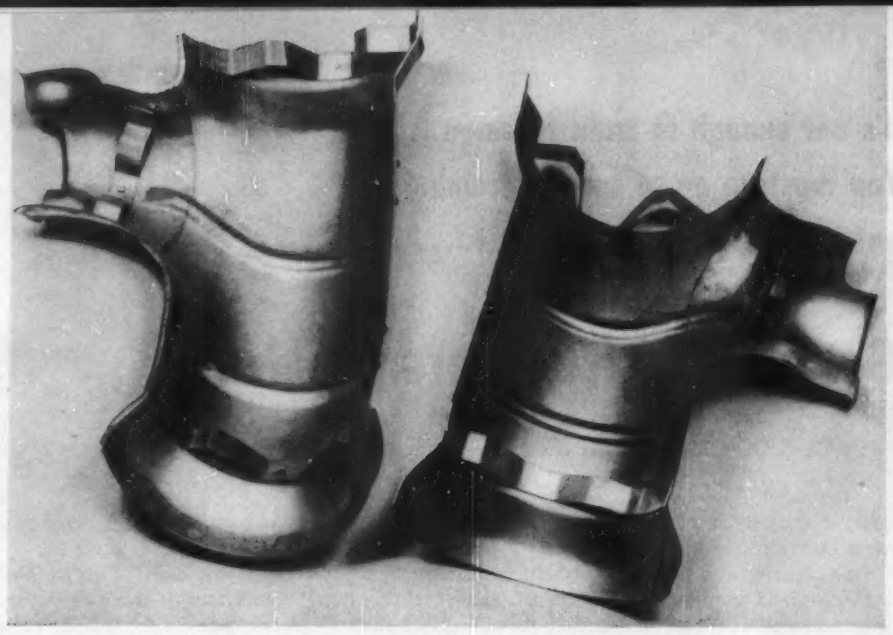
2. **Plan on Resistance to Change:** If you are teaching foremen something which will change their present method of doing things, don't be surprised when they don't grab at it eagerly, even when it seems to offer them many benefits. Inertia, fear of the unknown, and habit will keep them in the same old rut unless an aggressive plan of change is introduced and followed through. This can't be done in the classroom, but must be done in follow-up visits, inspections or meetings after the course has ended. One company followed up a work simplification course with monthly meetings at which each foreman reported on his progress. This forced them into doing something to report.

3. **Work Habits Can Be Modified:** The key to better methods of work or supervision lies in the habits of the man on the job. If he is in the habit of giving his men tongue-lashings for every minor mistake, his habits must be changed before he will start applying human-relations methods in supervision. This may require coaching, advising, or even reprimand. One foreman never quite accepted what he heard in a human-relations course. It took a thorough dressing down from the plant manager to bring about a significant change in his habitual manner of handling people. Breaking a work habit is like breaking any other habit; you will be most successful if you supplant it with something more satisfactory, prevent relapses through supervision, and make the new method attractive.

4. **Toughness Alone Isn't Enough:** Although there are occasions when the "get tough" doctrine is required, in most instances it won't solve all of your problems in making training effective. One of the most successful safety programs is based upon a training course followed up by what the safety director calls "steady needling." In some instances, it can undo the objective of training to get rough with the boys. It wouldn't help a human-relations course, for example, for the foreman to be told that "unless you boys use this stuff, some heads are gonna roll." On the other hand, where all other steps have failed, firmness and force may be a last resort.

TO SUM UP:

Training is not a substitute for good management and skillful supervision. It merely presents the whole picture of what management wants of its foremen in an organized and presentable manner. Far from making supervision of these men easier for a short time, it requires more management attention. Once the new work habits have been established and are being used, the management job will be easier; and the plant will be operating more smoothly. Training expense is well justified when it brings results in the shop, but this can only come about by management follow-through to assure that work habits improve and the trainees put their knowledge to use in making the shop run better.



Results of a study made for the Air Force . . .

. . . show titanium can be formed hot or cold and can be resistance- or fusion-welded, as these engine shrouds for a Piasecki helicopter prove. Procedures are not easy, but good methods control can keep production up to quality par

How Ryan forms and welds

Titanium might well be thought of as a temperature-sensitive metal, in this respect; at 600-700F it can be formed, drawn, and hammered fairly easily, with reasonably good results. But at room temperature, it seems to be in a critical range where it starts acting like a prima donna. Some processes work; others don't.

For example, early Ryan tests on a drop hammer were not successful except for shallow draws. The impact fractured the titanium stock after only slight deformation. These tests were with the metal cold.

But cold forming *can* be done. On the hydraulic press, with ram speed as low as possible (about 1 in. per sec), titanium blanks with an original dia of 10¼ in. were drawn into hat sections 3½ in. deep. Four successive draws were necessary, but these were made without removing the work from the press die. Maximum recovery time seemed to be essential. A dry lubricant was used.

Cold forming can also be done on a punch press, but metal flow is most important, and so is lubrication. Copper-plated blanks dipped in forming lubricant were produced, and blanks coated with colloidal graphite (which is cheaper and easier to apply) were formed satisfactorily.

HOT FORMING

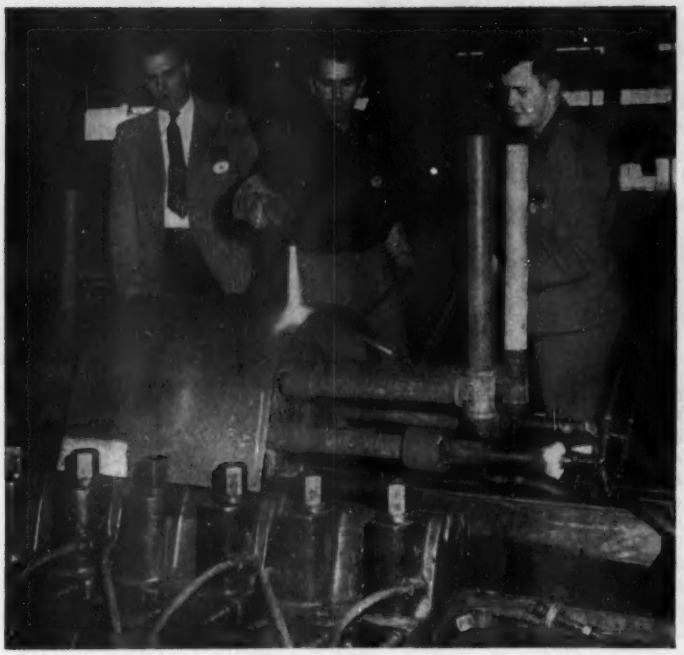
But best results in forming have been with heated stock. Most often it is furnace-heated to about 1000F; then the stock drops down to the 600-700F range by the time actual forming takes place.

One good method follows the procedure for stainless steel. A Kirksite die, lead punch jacketed with mild steel on contact faces, and large high-temperature-rubber pad are utilized in a drop hammer. Lubricant is SAE 250 oil, which is essential for lubricating and insulating the heat. The mild-steel punch jacket also insulates, and prevents lead contamination.

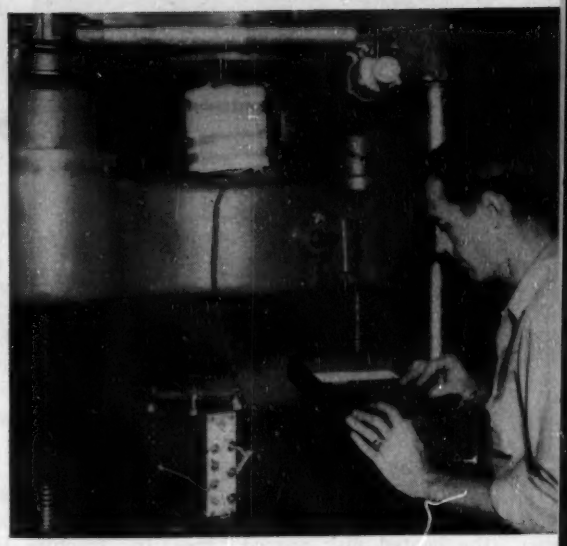
Smaller rubber pads are located around the edges of the work. As the depth of draw increases, these are reduced until the extra rubber is quite thin. When the pattern of rubber placement has been worked out for the part being formed, full-impact hammer blows are possible.

After-treatment to remove lubricant residues and heat oxides is usually an 800F salt bath, followed by a nitric-hydrofluoric rinse.

Results have been good, and Ryan engineers conclude that commercially pure titanium can be formed to the same contours as can stainless steel, as long as edge and corner radii at abrupt contour changes are carefully selected, and



STRETCH PRESS WITH COMBUSTION-HEATED DIE forms titanium sheet as it is heated by gas torch. Blank should be maintained at about 700F for optimum forming results



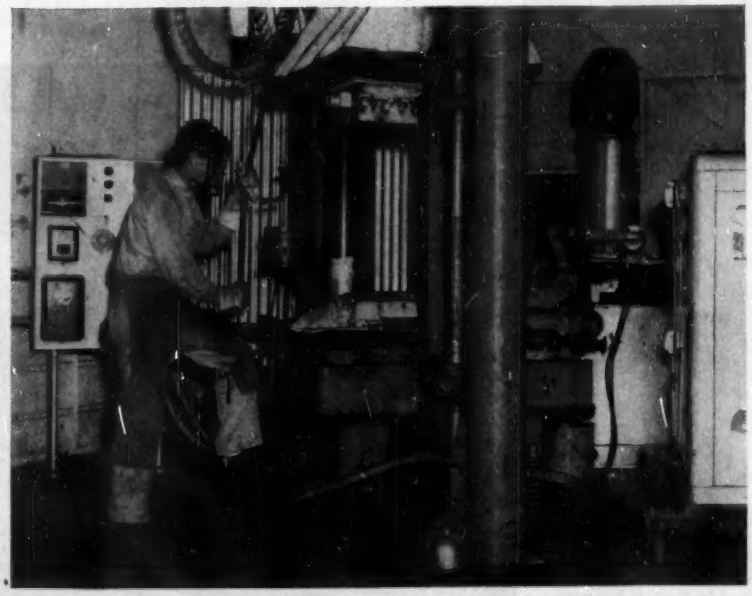
TENSILE TESTS with sample heated by induction showed importance of heated dies and/or parts when complex contours must be formed. Even so, some cold forming is possible provided close attention is paid to minimum radii and lubrication requirements

titanium

stage dies are used when needed.

Flanged titanium parts have been formed with trapped rubber contained in a heavy steel box attached to the head of a Cecostamp air hammer. A pad of high-temperature rubber is placed over the blank to protect the trapped rubber. Parts have been produced this way, but they showed that titanium has a strong resistance to the absorption of material in compression flanges.

One other method of stock heating has been used. Electrodes have been attached to the stock, in the press, to heat it electrically while the rubber pads are being placed. This system saves time and conserves heat, but the press setup is naturally more complex.



DROP HAMMER FORMS SHEET STOCK while die is held at 575 to 700F (at die surface) by 1000F molten Hi-temp salt circulated from heater. Punch operates at about 300F, held there by electric coil

HEATED DIES

Parts have been produced with both heated blanks and heated dies, although the procedure is

DIMPLING DIES ARE HEATED to 600-700F by electric coils. Difficulties and results are about the same as with 75ST aluminum, except that die temperature must be higher to cancel out inconsistencies in the sheet stock

not necessarily recommended for production work. One drawback is that for best die fits, they should be ground in the hammer or press at operating temperature. This is difficult and hazardous; and the heated dies proved generally to be less efficient in keeping the metal hot than expected.

Stamping work was done with dies heated by circulating Hi-temp salts and punches by cartridge or Calrod electric heaters.

BENDING

Successive tests of bending samples were made with stock thicknesses of 0.018, 0.040, 0.080, and 0.125-in. stock. The 0.018-in. material took a 1.7-T bend without fracture in either the transverse or longitudinal direction. Minimum bend radii for the 0.040-in. stock ranged 1.66-2.35 T in the longitudinal direction and 1.95-3.90 T in the transverse direction. The 0.080-in. stock took 1.95-2.35 T longitudinally, and 1.70-2.54 T transversely. For the 0.125-in. stock, minimum bend radii were 1.50-2.12 T longitudinally and 2.12 T transversely. Edge preparation, which was changed from sheared, milled, to polished, seemed to have no effect.

FUSION WELDING

Shielded-arc welding is the only fusion process that works because titanium combines with and is embrittled by all known welding fluxes, as well as air.

Tests with heliarc, both automatic and manual, were encouraging; and few cautions other than those usually necessary for stainless steel are necessary.

At an automatic heliarc machine, butt welds have been made at a speed of 27 ipm, with welding current of 65 amps. Electrodes are ⅛-in. thoriated tungsten spaced 5/32 in. apart. The weld is followed and blanketed with argon by a ⅜-in. flared outlet, and a grooved backup bar is used to blanket the underside of the weld. Total gas consumption is about 27 cu ft/hr, with 20 of this for the electrode side.

Best backup is a copper bar, which is enough when welding light gages if the work is pressed tightly against the bar. Otherwise, a grooved gas bar should be used.

SHROUDED EXHAUST SYSTEMS for the "buried" engines in Piasecki helicopters, here being assembled, perform well at temperatures up to 500F

Welds tested out good enough to make the parent metal fail before the weld did. The usual precautions against burn-through on light gages and for straight shear cuts of the parent material are necessary. Welds take 180° bends in both directions.

Sigma welding with 0.125-in. sheet and 0.64-in. titanium wire has been done with success, too. Circular passes on one side of the stock showed 20 to 40% penetration. Bend tests showed 180° was possible with the bead in compression, but only about 45° was attained with the bead in tension. A hard contaminated skin is evidently formed, and failure starts from surface cracks about 0.007 in. deep.

Welding discoloration is removed by salt-bath processing at 800F for 10 min, followed by 20 min of pickling.

Manual heliarc welding with titanium wire used as a filler is practical, too, although reasonably good care must be maintained to insure proper root penetration on lap joints.

One odd effect was noted when cylinders were welded up from titanium. Normally, with stainless stock, some shrinkage results from welding, but the titanium cylinders did not shrink at all. In fact, it was necessary in some cases to shrink the cylinders to make them fit mating parts.

RESISTANCE WELDING

Spotwelding pressure seems to be all-important with titanium. Low pressures produce large nugget grains, but above about 2000 lb the structure gets finer. Penetration was extreme at low pressure, but ranged from 10 to 50% at 3000 lb. Best results were with good precleaning, fairly high electrode pressure, and short welding time.

Electrodes for spot-welding titanium give best results when they are Class II or III, with ⅜-in. faces and 3-in. radii. Penetration ranges from 40 to 45% and nugget diameters from 0.145 to 0.150 in.

RIVETING AND DIMPLING

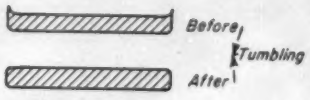
Good riveting results can be had with standard riveting guns and bucking bars using flush rivets, pressure up to 5000 lb, and pressure time of 1 sec; but button-head rivets will not work this way. If button-head rivets are annealed for 20 min at 1300F, however, and driven by 5100 lb, they will set properly.

Hot riveting can be done on a spotwelder fitted with counterbored electrodes to fit the rivet heads.

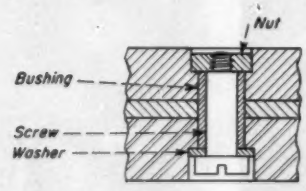
Dimpling worked out easily, and only differs from dimpling 75ST aluminum in that the material has to be heated to 600-700F by resistance elements in the squeezers. Lower temperatures do not overcome inconsistencies in the stock, and results may vary.

Diemaker's Kinks

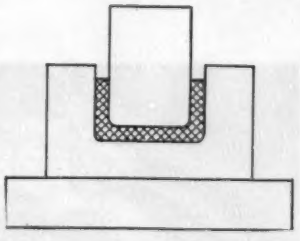
FEDERICO STRASSER



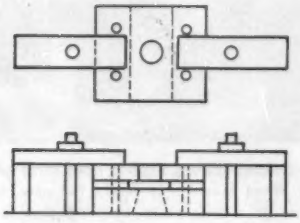
BY TUMBLING BLANKS for second-operation work, you get rid of the burr, which always presents trouble, and especially when: (1) the bend is sharp—less than 90°, and (2) the material to be formed has high tensile strength—spring-quality stock, for example.



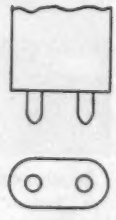
IF SPACE is limited in a press tool, so that both clamping screws and dowel pins cannot be used, bush the members and fasten them with a snug-fitting screw and nut.



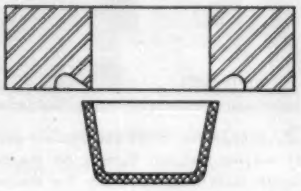
FOR SETTING forming or bending dies, put a formed piece between punch and die. In this way the correct position and travel of the punch are easily established. For this use, it is advisable to keep a finished part with the forming tool, when placed in storage.



SHORT-RUN DIES need only be clamped to the bed or bolster. Avoidance of clamping screws reduces tool cost.



PILOTS for progressive dies should be used in pairs, except in the case of washers, rings, etc., to provide positive guiding and alignment.



FOR BETTER STRIPPING of drawn shells made in push-through dies, cut a recess or formed channel on the underside of the die plate.

Pre-positioned setups speed job-lot production

Taking a leaf from transfer-machine principles, engineers at Glenn L Martin Co have developed a three-point positioning system using standard universal setup plates. Thus, jobs can be set up away from the machine; then moved to the machine, located, and clamped, ready to run, within a few minutes. Work can be transferred between machines with equal speed and without seriously disturbing the setup. The technique suggests a number of tooling possibilities

1..MASTER PLATES are permanently fixed to the machines; are provided with slots running in two (perpendicular) directions and spaced so that, on the profile miller, the work and the profile templet are held exactly 15 in. apart. This is the distance between the stylus center line and the center line of the tool chuck. Universal setup plates permit location of work and templet fixtures within a couple of minutes

2..MATCHING RISER BLOCKS are used to accomodate jobs of varying heights. Buttons on the bases of these blocks locate them in position on the master plate and grooves in the tops of the blocks duplicate the grooves in the master plate. Thus, height differences in various jobs are readily compensated

3..WORK-HOLDING FIXTURES and templet-holding fixtures have three pins or "buttons" in the base per unit. When machine is ready for new job, operator simply places preset fixtures on master plate. Locating pins drop into the slots and the tool is automatically positioned square and true. After repeating the procedure with the templet fixtures, the job is ready to run. Thus, changeover is rapid and downtime is a small fraction of what it was by conventional methods. This system permits fixture interchangeability between several profile millers. Thus, not only do single machines achieve maximum utilization, but the entire shop is kept working at capacity

4..MULTIPLE-JOB SETUP, and machining, is readily accomplished. Job at far end of machine has two templets, one solid templet suitable for the hand profiler and the other, of lighter construction, for an automatic profiler. Thus, as work-load conditions change, the latter job can be shifted to an automatic machine with a minimum of lost time. When job is set up on an automatic, both templets are used and, while one piece is being machined, the other piece is either loaded or unloaded, to provide continuous operation. One job is a wing-spar fitting; the other is a flap-hinge bracket

5..MULTIPLE-CUT SETUP is equally fast. Here, the machine is profiling the end of a wing-spar cap. When this operation is finished the long slot will be cut, guided by the templet shown in the lower part of the picture. The part need not be moved nor the machine stopped, except to change tools, during the entire series of operations

Setup time reduced 75%

Positioning by the former system required several steps. Setup reference lines were engraved on the work-holding fixture and on the templet fixture, then these lines were used by the operator to position the templet true to the machine. Next, with the templet fixture in place, the work fixture was positioned relative to the templet, with the help of a scriber mounted in the tool chuck. This step required much time; was based on trial and error. Once the work fixture was in place, the work position had to be checked by the same procedure. The slightest error in setup could spoil many pieces.

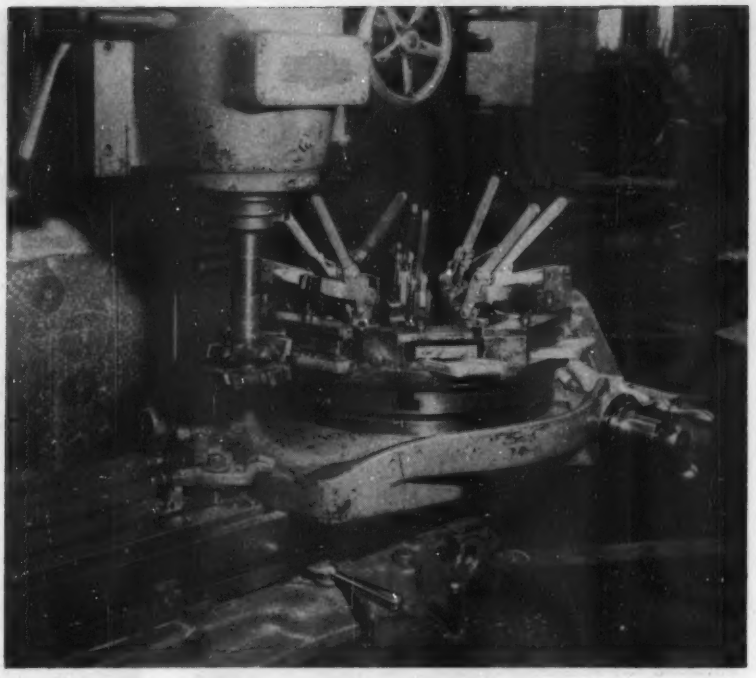
Standard setup time for the wing-spar fitting and for the flap-hinge bracket (Fig. 4) was 90 min each under the old method, for a total of 3 hr for the two jobs. Using the three-point positioning method and multiple setup, the new time is approximately 45 min for both jobs — only 25% of the original time.

Use of the new system, together with multiple-cut techniques, made it possible to reduce a two-machine, laborious task to a single simple operation. On the spar cap (Fig 5), the end cut was made with an automatic profiler and the flange slot was cut on a vertical mill, with the latter requiring hand filing to complete certain small radii.

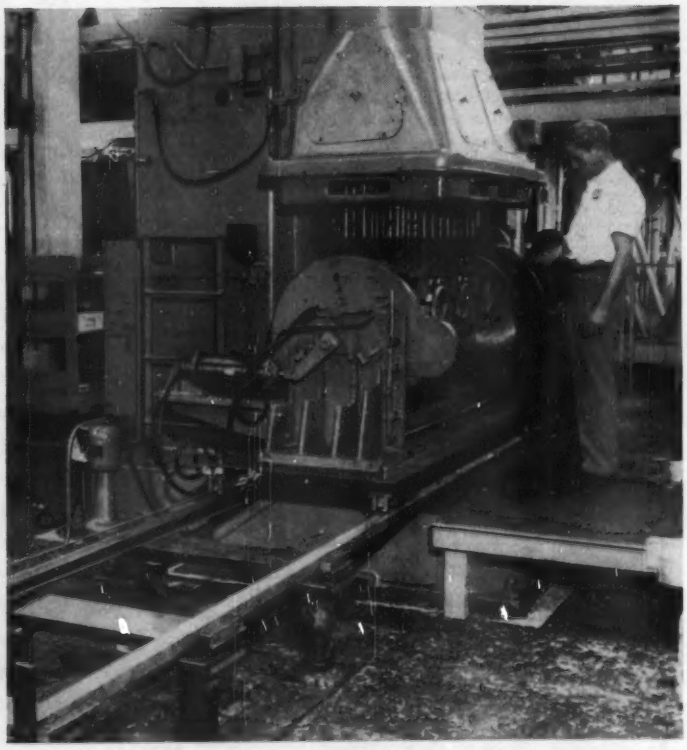
Setup time was reduced from 208 min to 90 min and running time was cut from 30.68 min to 12.78 min by completing the job on the profiler in one setup using the new system. And loading time, a considerable factor in the former method, is not included in these figures.

Pre-positioned setups . . .

continued



6. POWER-DRIVEN ROTARY TABLE is used to provide multiple-piece setups, for small parts, on conventional milling machine. Miller operates continuously while the operator manually loads and unloads parts in the fixtures on the rotary table. Vertical straddle-milling cutter simultaneously machines both faces of part



FIXTURE MOUNTED ON RAILS permits almost continuous drilling. Two fixtures are used in this setup and rails extend slightly more than one fixture length at each side of multiple-head drillpress. While the machine is drilling, the part is held in one trunnion fixture and the other trunnion fixture, identical in design, is unloaded and reloaded. When drilling is completed on the former piece, the latter fixture is quickly and easily rolled into the correct position for drilling. Frequently, fixtures are designed to swivel the part into two or more positions for a variety of drilling operations. Also, a new job may be set up while a preceding job is still being drilled

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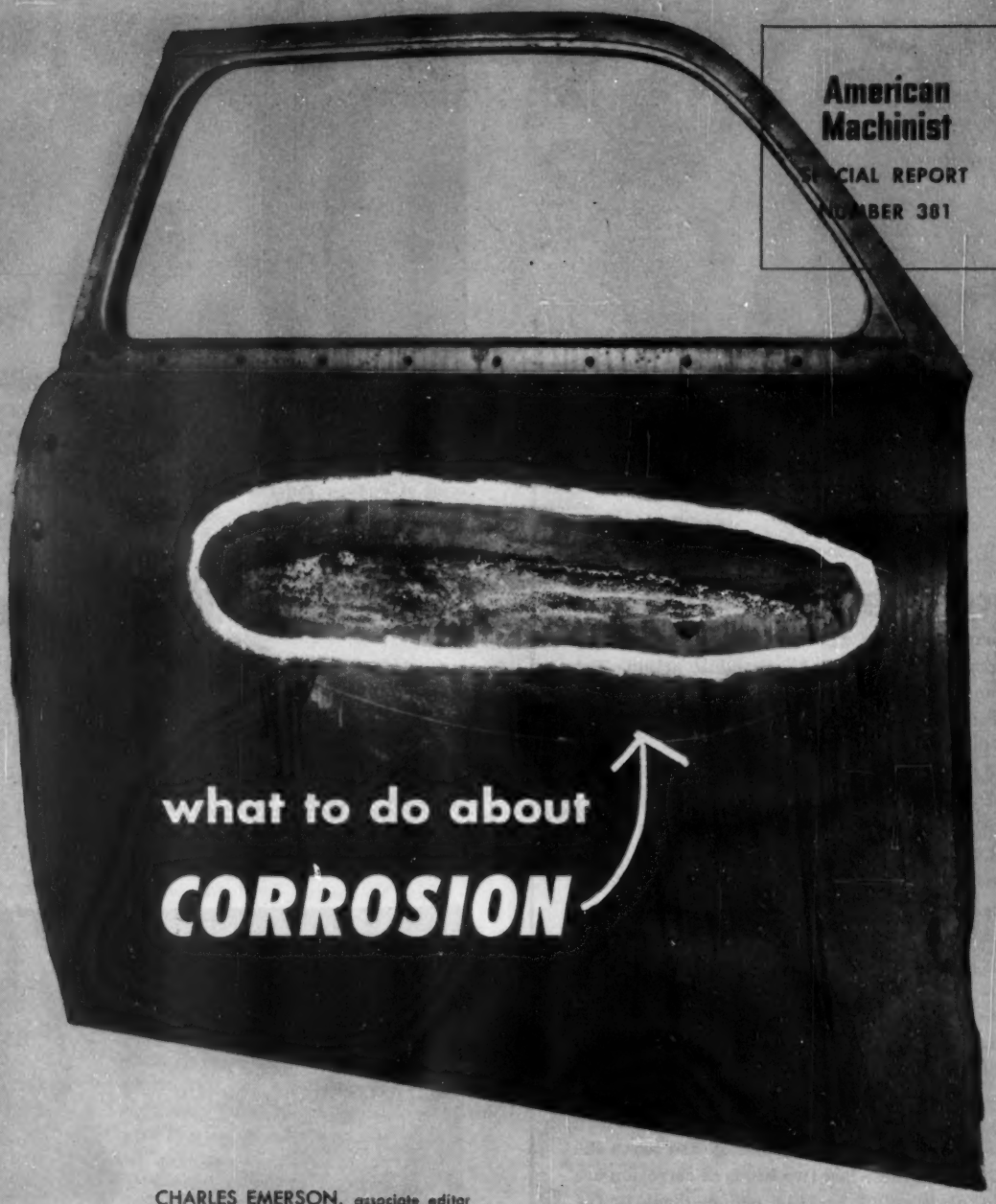

what to do about CORROSION

CHARLES EMERSON, associate editor

Old Man Rust is a threat to almost every metal product made — either directly or by causing damage to machines and instruments. Corrosion is often a problem in material storage, during machining, and even on the assembly line. To help beat corrosion, here is a roundup on what causes it, what materials and techniques help to control it, and how to prevent it.

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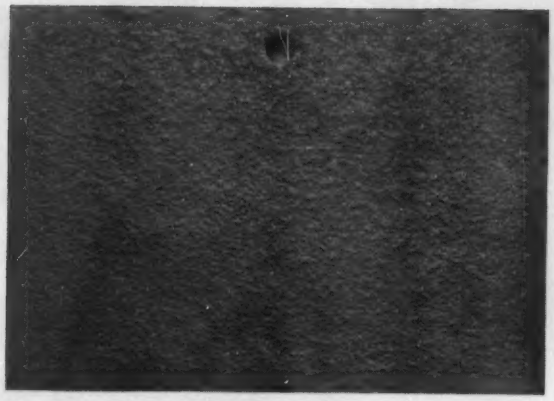


MARINE ATMOSPHERE CORRODED this untreated, uncoated sample of ingot iron uniformly in 1500 hr to the stage shown. Porous mass of iron oxide is visible. This was piece of fairly uniform quality and content, proved by the fact that there are no large pits or areas of excessive corrosion

According to Webster...

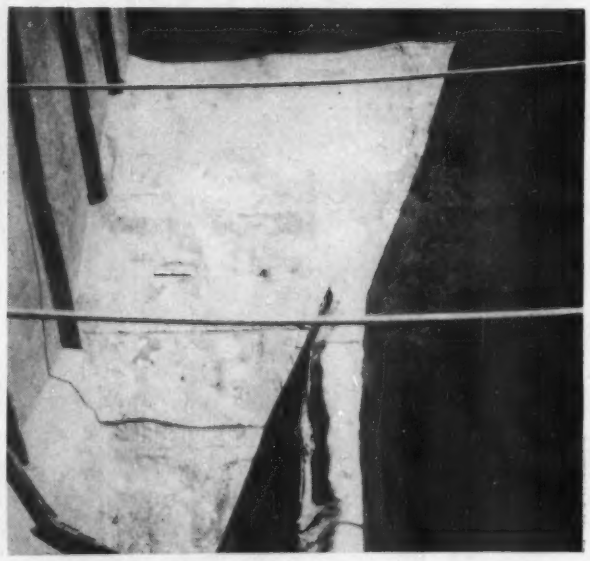
Corrosion is the gradual eating away or disintegration of a metal by chemical action. The dictionary also states that atmospheric and similar corrosion of metals is essentially oxidation of electrochemical origin.

There are a number of types of corrosion, not all of which appear on all kinds of metals. UNIFORM corrosion is the conventional action where outside surfaces of a metal are attacked. This shows up as rust on iron or steel, tarnish on silver, and fog on nickel. PITTING is localized attack at some areas, sometimes where impurities in the metal are concentrated, or where stresses in the metal aid corrosion. DEZINCIFICATION is the loss of zinc in such an alloy as yellow brass, where the copper of the alloy remains. Plug dezincification is local, while layer dezincification is a general attack. A similar corrosion is PARTING, which occurs in noble alloys, and which might attack the silver in an alloy and leave the gold. Both of these last two kinds of corrosion are called preferential because one element in the alloy is corroded, while the other or others are not.

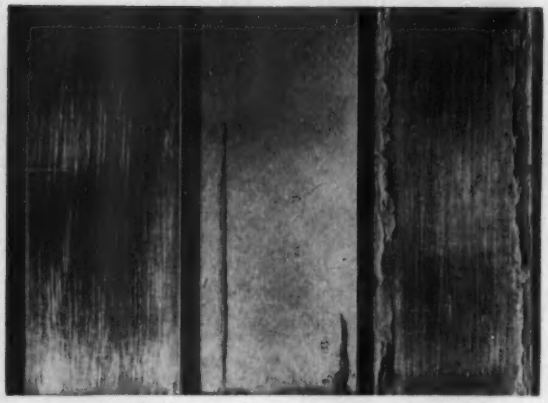
INTERGRANULAR corrosion in an alloy is the result of improper alloying or handling, such as heat treating, and occurs along paths of compounds between metal grains. CRACKING can be the result of stresses or fatigue in any metal, but generally the conditions of stress or fatigue and the corrosive atmosphere have to be just right to produce this kind of corrosion.

Why metals

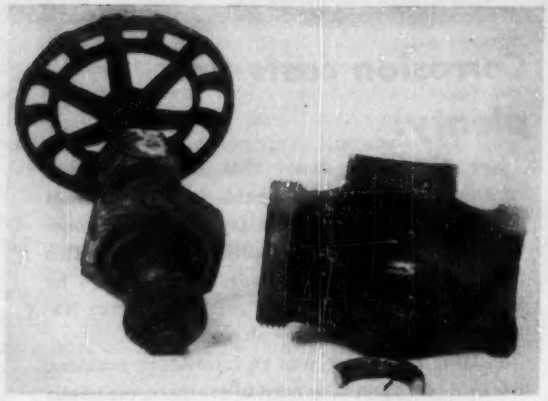
The reason for corrosion is part chemistry, part physics, and part metallurgy. Roughly, the important factor in corrosive action is some kind of ion exchange in which the metal is taken into solution in an electrolytic cell, similar to a battery, that forms against the bare metal. Evidently some kind of electrolyte must be present, and some element



COAL-HOPPER RAILROAD CAR made of sheet steel was corroded with coal, and its sulfur content, helping to speed up the process. Electrolytic cells are set up when moisture condenses on floor, using sulfur as sulfuric acid, and steel is gradually eaten away. Patches are caused by acid concentrations and abrasion of coal being chuted out



THREE STAINLESS-STEEL SAMPLES showed crevice corrosion after 14 days of exposure to salt water. Improper heat-treating probably caused intergranular corrosion



SEA WATER PUMPED AT 80 GPM through globe valve caused this much destruction in 33 months. Valve body is bronze; seat, stem, and disk are monel. Performance might have improved if metals had been closer together in galvanic series

corrode

which will combine with the metal element is necessary.

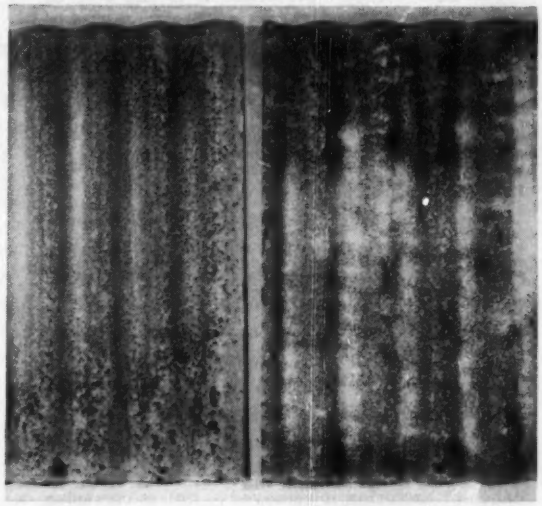
In the case of rusting, in which iron oxidizes, the electrolyte is formed with water, and the element that combines with iron is oxygen. Both must be present, and this condition can be met by water that has absorbed some free air or oxygen alone, or by air containing water vapor. It is unusual to find water without some absorbed air, or air without some water vapor, under natural conditions.

Proof that air must be absorbed in water to cause the corrosion of immersed iron is the fact that hot-water heating systems for houses, where the water is in a closed system and little if any water is ever added, do not corrode pipes rapidly — in fact some pipes have lasted more than 40 years. The opposite is true, as evidenced by the constant fight power plants must make against corrosion where the water is aerated constantly, thereby picking up air (and oxygen).

Water must be in liquid form to promote corrosion. Normally, water vapor condenses easily on metal surfaces, but in the arctic, for example, where there is low humidity anyway, most of the water that condenses forms frost (ice) immediately. There is plenty of oxygen present, but ice will not act as an electrolyte, so rust forms slowly, if at all.

Corrosion can also progress in atmospheres other than air; for example, chlorine or ammonia. Corrosion is actually a complex problem, and there is some doubt about some of the factors that control it, especially in the areas where corrosion has not been studied thoroughly. High-temperature performance of metals is sensitive to corrosion, and research is constantly turning up new information in that field. The rarer metals, although they are generally more stable than iron, pose problems in corrosion, too, if they are to be utilized widely.

But the main concern with corrosion is in atmospheric conditions, where oxygen is the element that combines with the metal, and where water vapor is the catalyst that allows corrosion to proceed.



GALVANIZED SHEET AFTER SIX YEARS' exposure has had zinc corroded away and steel is starting to rust. Zinc coating can protect steel sheet even after it is partly corroded, but large areas of exposed steel will start corroding, too

Corrosion costs you plenty!

Let those who doubt that corrosion is an enormous problem consider this fact: The current cost of corrosion to US industry per year is something over $6 billion—not million; BILLION. This is based on an estimate made five years ago by Herbert H Uhlig in a paper presented to the National Association of Corrosion Engineers.

Getting this figure was an interesting problem, because corrosion is so hard to evaluate, especially on a nation-wide basis. The estimate took in a lot of territory, including pipeline losses; costs for treating and repairing boilers, oil wells, and machinery; and value of products sold directly for resisting corrosion.

One big example of corrosion costs was phosphate coatings, which are necessary mainly for protecting against corrosion. These cost industry $20 million five years ago, and the figure must be higher today.

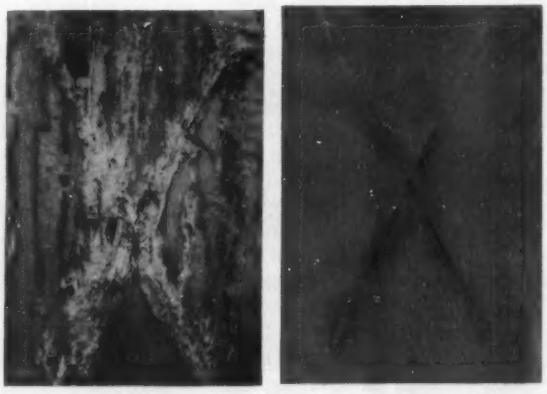
Compare the cost of corrosion to the cost of fires in this country. Losses from fire, per year, amount to about $700 million; and while publicity and the very spectacular nature of fire make these losses well known, no effort that even remotely approaches the campaign against fire losses has been made against corrosion, which costs almost ten times as much.

The reason for the discrepancy in attention — at least one reason — is that corrosion is so insidious. It progresses quietly. It isn't particularly unexpected — at least to experienced industrial people — and it often appears in forms that seem to do no harm. A stack of rusted castings in the plant yard can be brought into the machine shop, worked on, and sent through normal processing. If the standard procedure in the finishing department is to treat the left-as-cast surfaces, all evidence of corrosion is removed — unless corrosion has cut below the scrap material to be removed by machining.

Unfortunately the fact that some corrosion is harmless tends to dull or cloud the danger involved in many other cases.

Another estimate was made by Mr Uhlig in the same paper. He guesses that a five-year program of research, development, and education (note the factor: Education) might save, at a cost of 0.5 to 1% of the savings, over $900 million of the cost of corrosion to industry per year. This program was never undertaken, at least by industry as a whole, but it *could* have been done. It still can be done.

CORROSION ENGINEERS TAKE PICTURES of exposed carbon-steel piling at Kure Beach, NC, where salt-water tests are made on sample metals. Tests and checks show salt-spray corrosion is generally proportional to atmospheric corrosion on most metals, but much faster; therefore salt test gives reliable results faster



PAINT SAMPLES AFTER SALT-SPRAY TEST show value of undercoating. Piece at left was cleaned, dried, painted. Sample at right had phosphate coating under paint. Photos were taken after 480 hr. Scratched X's were to let corrosion start on metal base

Lazy maintenance

The human factor in preventing corrosion is as big as any, and is, in spots, most difficult to deal with. Farmers have been to blame, in many cases, for cutting the lives of their heavy equipment (such as tractors) in half because they either provide no proper storage place and corrosion-fighting maintenance, or because they just forget to treat their machines like machines must be treated, and leave them outdoors.

Industrial workers, too, are often guilty of grossly

mishandling expensive equipment, often simply because they were not taught the necessary steps when they were trained for their jobs. Machine maintenance is not a natural-born talent; it is an acquired habit and must be learned. Few machine operators, for example, are in the habit of taking an oil can and squirting the fittings on the machine every once in a while—yet there are some workers who do this, and probably not because they were told to, but because they were familiar with machines and appreciated the lubricating and rust-preventing requirements of the equipment.

An important answer to bad maintenance is education; not just at the maintenance-crew or foreman level, but education of all workers, who deal with any kind of machines. It is a management responsibility, as if management didn't have enough responsibility already; but it is one that can repay itself easily in saved capital-equipment dollars.

Many oil companies and other manufacturers of corrosion preventatives have literature that they would be happy to distribute. A dose of printed matter and some intensive selling from management level all the way down through the shop can save good metal, though those who look for immediate and spectacular results will be disappointed.

Corrosion prevention is a thankless, seemingly pointless task, because the only evidence of success is a lack—of machine failure, of red rust, and of customer complaint.

What happens to metals

Iron corrodes steadily, with rust developing uniformly — or almost uniformly — as the attack penetrates the bare metal. Eventually, a piece of iron can be corroded so deeply that only a spongy mass of rust remains.

Not so with copper, for example, which forms a number of corrosion products, singly or in multiples depending on conditions. Most copper corrosion products form thin films that halt further corrosion and protect the raw metal underneath. This is one of the important advantages of copper, for these films can be synthetically reproduced and controlled to affect the appearance of the metal. In a product, this is one way to attain beauty without adding paint.

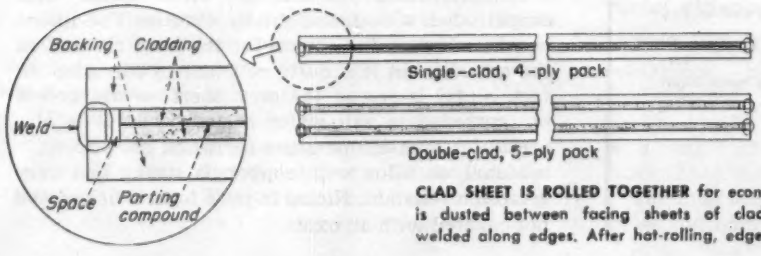
Copper can form the red cuprous oxide when it is heated, then cooled in water. A black cupric oxide forms when hot copper is cooled in air. The familiar mold-like green that develops on copper when it is exposed for some time outdoors is a mixture of hydrated copper carbonate and basic copper sulfide, which corresponds to rust on iron, but which does not usually progress beyond the protective film.

These oxides and salts on copper can be buffed off, whereupon the process begins and continues until another film is formed. The film interferes to some extent with the electrical and heat conductivity of the metal, but it is thin, and the affect is slight. In electrical applications, like switches, devices using copper are usually designed so constant action will abraid the oxide and will keep contacts clean.

Aluminum works in a similar manner. The corrosion product in air is a thin oxide, almost colorless, but which dulls the surface of the metal slightly. It is about 0.0002 in. thick, and protects the bare metal underneath against further corrosion. Aluminum oxide breaks down in a salt-water atmosphere, however, or in the presence of chlorine, and corrosion can proceed rapidly thereafter. Caustic soda and lye are corrosive against aluminum by dissolving the oxide as well as the metal. Under poor conditions, aluminum is subject to intergranular corrosion.

Most aluminum alloys resist corrosion almost as well as commercially pure aluminum except for high-strength aluminum-copper alloys, which are more stable than structural steel, but still should be painted or protected in some other way. Alclad was developed to use the resistance of commercially pure aluminum with the strength of less-resistant alloys, and is made by rolling the purer aluminum onto the surface of the base alloy.

Anodizing is a process taking advantage of the oxide film aluminum forms, because a dye or pigment may be absorbed into the film to give the metal almost any color. The anodized coating is made by electrolytic oxidation, then the coating is sealed in boiling water or dichromate solution.



CLAD SHEET IS ROLLED TOGETHER for economy. Inert parting material is dusted between facing sheets of cladding, then stack is tack-welded along edges. After hot-rolling, edges with welds are cut away

EFM series of metallic elements

MAGNESIUM
BERYLLIUM
ALUMINUM
MOLYBDENUM
ZINC
CHROMIUM
IRON
CADMIUM
TANTALUM
COLUMBIUM
NICKEL
TIN
LEAD
COPPER
SILVER
GOLD

Metals high on the chart are more active, those lower are less active. Metals close together on the chart have less potential between them, and are therefore less likely to promote corrosion when used together. Exceptions: Aluminum, chromium, and nickel act like more passive metals than they really are

Galvanic metals series

STAINLESS STEEL (PASSIVE)
MONEL
SILVER SOLDER
GUNMETAL
CUPRO-NICKEL
COPPER
BRASS, ALUMINUM BRONZE
NICKEL
MANGANESE BRONZE
TIN
LEAD
TIN-LEAD SOLDER
STAINLESS STEEL (ACTIVE)
CAST IRON
STEEL
CADMIUM
ALUMINUM ALLOYS
ALUMINUM
GALVANIZED STEEL OR IRON
ZINC
MAGNESIUM ALLOYS
MAGNESIUM

This series rates the more common metals and alloys as to anodic (more easily corroded) and cathodic (less easily corroded) values. It is a rough rating only. Metals to be assembled should not be widely separated on list. If outer metal is lower on list, it will sacrificially corrode, protecting metal higher on list

Magnesium

An oxide film similar to aluminum oxide forms on magnesium, but it is not as permanent or protective, and is somewhat powdery. The two surface treatments most used are chrome pickling and dichromate dipping, both of which form bases for painting, and are semi-permanent if not covered. Magnesium is high on the EMF scale, and it corrodes easily if joined by other metals in mechanical assembly; usually it is painted to sidestep this problem. Magnesium is not normally subject to intergranular corrosive attack, but corrodes uniformly. It can be cladded and electroplated, as well anodized. If very pure, it resists salt-water corrosion to a high degree.

Zinc

Another metal that becomes thinly coated, then does not corrode further in normal atmosphere, is zinc. It forms a hydrated oxide or carbonate that resists weathering and water. As die castings, zinc may be alloyed, but it must be pure to 99.99% to start with. It is alloyed with small amounts of aluminum, magnesium, and copper. Some other impurities, even in small amounts, allow zinc to corrode rapidly.

Lead

Lead oxide forms slowly, in a matter of a few days, making the metal dull gray. Lead resists corrosion well, but is evidently sensitive to heat in relation to corrosion, because live steam and boiling sulfuric acid make it corrode, while it is inert to water (and air) and is fairly resistant to cold sulfuric acid.

Tin

As plated on sheet steel made into food cans, tin is the reason they are called "tin cans," which they are not. Tin is porous, and is cathodic to iron; therefore it allows iron to rust on exposure, and rust will form through the tin on a can. Inside the can, the low air pressure and presence of food reverses the electro-chemical condition, and tin will corrode inside before the iron will. Tin forms stannic oxide and tarnishes slightly with age.

Copper wire is tinned because it tends to combine with sulfur in rubber insulation, while tin does not.

Nickel

Chrome-plated products are often coated with copper, then nickel, and finally chrome. The nickel is soft, which is the reason for the hard chrome on the outside; but it is quite resistant to corrosion. In fact, nickel is one of the most inert metals, and is not corroded in salt-water atmospheres. It is also useful for high-temperature corrosion protection.

Monel, an alloy with copper, is strong and very corrosion resistant. Nickel in pure form is bright and not covered with an oxide.

Chromium

As a plating, chromium is hard enough to protect wear parts, and is highly resistant to corrosion.

Iron

Steel is used 75 times as much as any other metal because it is cheaply mined, produced, and worked. Actually, it has less corrosion resistance than many other metals, and is not as strong as several, either on a strength-per-weight basis or strength-per-volume basis. Its commonness makes rust the most ordinary evidence of loss from oxidation.

Pure iron, which is not produced in any quantity, is not too subject to corrosion in air, but impurities are difficult to exclude from iron and steel and they seem to have the affect of reducing corrosion resistance. Malleable iron, which has low carbon content, is often specified for its corrosion resistance (with strength). Cast iron is the next corrosion-resisting iron.

Iron can be made quite corrosion-resistant by adding about 15% silicon, or by producing various types of stainless steels, using nickel and chromium as alloys.

Tool and die steels are not generally corrosion resistant; most alloy steels made for strength and hardness contain elements that do not inhibit corrosion, and in some cases hasten it.

Protection

Because strength, hardness, ductility, or other physical properties are so often needed in metals, corrosion resistance is often not considered when specifications for a particular application are being drawn up. With highly developed products of the paint, oil, and other industries readily available, corrosion is often left to the finishing department for a solution.

In most cases this is quite sensible, for metals cannot corrode internally — they must be contacted by some foreign materials that will act to set up the conditions under which corrosion can start. Thus, most corrosion protection is based on this idea: Get something between the bare metal and the outside atmosphere to keep them apart.

In the most common case of simple oxidation, this means keeping air and water vapor away from the bare metal.

Here are the most important methods of doing it:

Paint, varnish, lacquer, organic finishes
Porcelain, ceramic, and inorganic finishes
Petroleum products, oils, greases
Mineral products, asphalts, tars
Metal platings, claddings
Chemical treatments, like oxidizing, phosphating under controlled conditions
Inhibitors, treated paper coverings

Of course it is sometimes possible to control the atmosphere surrounding the metal so corrosion can't start; but few metalworking companies can use air-conditioning systems for this purpose. If metals are to be stored for some time, they can be placed in a closed room, and anhydrous chemicals, which will absorb the water vapor from the air, can be placed around the metal. This works in theory, but in most cases additional rust and corrosion preventatives are used.

Blueing and blacking are controlled oxides

Aluminum oxide, which forms rapidly on bare metal exposed to air, is a stable and impervious (to water and air) film that prevents the metal underneath from corroding. This same effect can be created on many other metals.

Gun bluing is an old art that has several variations, including blacking, browning, and graying. In addition, steel parts can be bronzed and mottled in processes that allow some of the surface steel to corrode, then stop the action to leave a coating that protects the base metal.

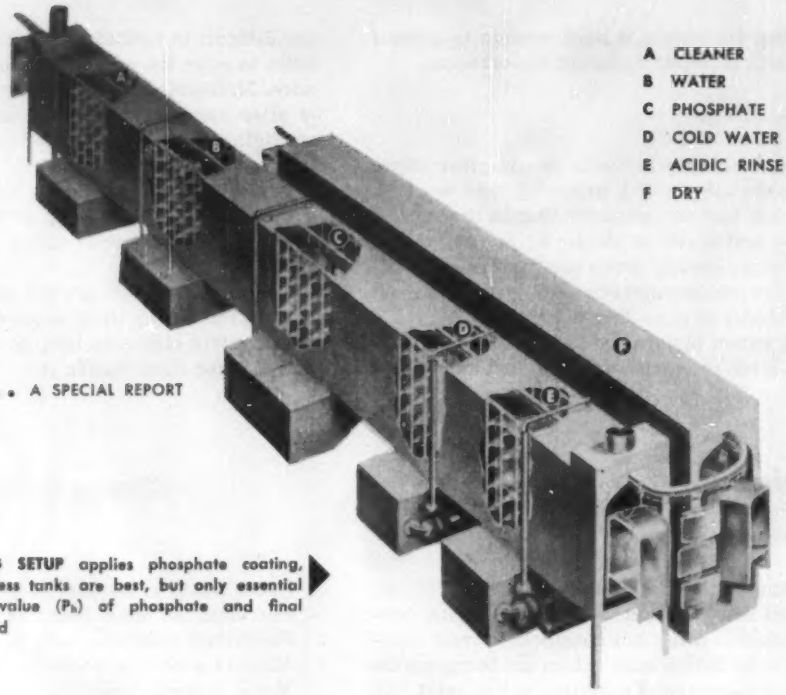
The simplest process is one where a steel part is dipped in hot water, then allowed to dry in a warm place. The loose rust that forms is brushed off, but some is left on. The technique is repeated many times until the brown coating is homogeneous over the entire surface of the part. To stabilize the surface to some extent, it is oiled.

Oxides of this type, on iron and steel, are not really impervious coatings, though with good treatment they can last for years.

Metal cleaning important

First requirement for a good oxide job is a clean workpiece — chemically clean, in fact. Commercial processes for producing oxides use alkali dips and acid pickles to clean the metal, which is then dipped in a tank containing a chemical that produces the oxide; then the part is dipped in a sealer tank.

The final sealer coating fills in between rust particles and helps make the finish impervious to light



CONTINUOUS BONDERIZING SETUP applies phosphate coating, usually as paint base. Stainless tanks are best, but only essential for phosphate tank. Acid value (P_h) of phosphate and final acid tank must be maintained

abrasion. If oil is used, it gives the part some lubricating qualities, too.

Steel can be blued chemically by immersing it in a 600F bath of niter (nitrate of potash—saltpeter) for a few seconds, then washing off the niter and oiling the surface. A hotter bath produces darker color, and vice versa.

Heat-treating produces blue color on clean steel if the metal is surrounded by the proper substance to give it color during heating. Hot sand, wood ashes, powdered charcoal, or molten potassium and sodium nitrates, mixed, will do it. The metal is heated until its color is about right, then quenched in water to stop action. Oiling afterward is necessary.

Blue-black finish

A higher temperature in the nitrate bath, up to 700F, will make the blue blackish. Another way to do it is to add some black oxide of manganese to the bath. If the steel is to be heat-treated, it can be brought up to temperature in a neutral austentempering bath, then plunged into a nitrate-salt bath. As in the case of any chemical or heat-treating oxidizing process, the temperature of the bath, the materials in the bath, and the structure and alloy of the metal have considerable control over the color produced.

Blacking

Gun blacking can be done with a number of chlorides, nitrates, or sulfates. The aqueous alkali-nitrate process produces the black oxide of iron, Fe_2O_3, about 0.0001 in. deep into the steel, and making the metal "grow" perhaps 0.000005 in. This minimum dimension change is sometimes necessary, so parts are often blacked in chemical baths to give them a finish without using a heavy coating.

Other blacking baths use alkali-nitrate at 900-950F (dangerous), nitric acid and nitric ether, copper sulfate, and many other chemicals. A steam process consists of coating the steel with a suitable chemical, drying, then purging the enclosure with steam. Then the parts are cleaned in water and brushed. Repetitions of this produce the required black color.

The Carbonia process requires parts to be heated in a furnace with carbonaceous material and oil present. This produces iron oxide and allows the carbon to penetrate the metal more than in other processes.

Browning

To get a black color, the chemical action on the metallic surface must be quite severe, but a milder process makes the surface brown. This can be done by coating the steel with water, ammonia followed by acids, or alcohol mixed with niter and other chemicals; then letting the steel dry in a warm place. Loose rust is brushed off, and the process repeated. Another way to do the same thing is to simply heat

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How to apply heavy zinc phosphate coatings to steel in tanks ...

DIPPING PHOSPHATE SYSTEM works slower than spray setup, but can be scaled down for small parts, low production. Dip in phosphate tank should be 3 to 5 min; final acid dip takes ½ to 1 min

the metal in 100% humidity for 1-2 hrs, then brush and repeat a few times. Oil is applied last.

Other colors on steel

Bronze can be applied to steel with bronzing salt — antimony chloride — or by heating the parts in vapors of aqua regia, dipping them in melted vaseline, and letting this stay on until it begins to decompose.

Heating parts in potassium cyanide to a cherry-red color makes the finish mottled. If steel parts are heated in a solution of antimony chloride, gallic acid, and ferric chloride, they will turn pale blue, dark blue, purple, and finally gray; but the process can be stopped when the color is any desired. The same solution, cold, will turn the steel surface a bronze color.

Durability

Oxide coatings are only as good as their consistency, in that a scratch or cut through the coating will allow corrosion to start, if atmospheric conditions allow it. If the coating is too thick, it may be easily scratched off; if too thin, it affords too little protection. Actually, on parts that will not be handled roughly, oxide coatings are good for many years if the right combinations of temperature, time, elements, and steel formula have gone into their production. Producing a good oxide coating can be a touchy proposition, but in some industries automatic equipment following preset cycles is used to treat metal parts in quantity and at low cost.

Other metals

Stainless steel is oxide-coated, mainly for appearance, with an effective bath of molten dichromate solution. In poor atmospheric locations, the oxide provides an extra measure of corrosion protection.

Copper, which with gold is the only metal that has a natural color worth talking about, can be treated by conditions of controlled oxidation. Actually, brass and bronze are most often colored with oxides. Brass can be turned white, golden, silverish, gray, blue, violet, and green. Blackening is done with a large number of chemical solutions. In most cases, however, the color is not deep or very permanent, so the parts are often covered with clear organic finishes, like lacquer. In effect, then, these colored oxides are not protective, for the lacquer actually does the protecting.

Phosphates are paint bases

Phosphating is an old process that has gone through considerable development over a period of almost 50 years. Originally, it consisted of dipping metal parts in a phosphoric-acid solution containing free iron particles, and parts had to be left in the tank for 3 or 4 hours with the solution at boiling temperature. Current phosphating solutions contain acids, detergents, and phosphates that produce a bonded phosphate surface with high affinity for oil, dyes, or paints.

This is now a generally accepted pre-treatment before painting, which it improves greatly. A phosphate coating has some corrosion resistance itself, but is suitable only for temporary protection of metal parts while in process or in short-term storage.

Its main virtue is in bonding a coat of paint, usually enamel, to the metal so that the solidity of the paint is better than if sprayed on bare metal. In addition, the phosphate provides some protection for the metal if the paint is penetrated or scratched. It prevents progress of corrosion along the surface of the metal by sealing the metal from the atmosphere at the edge of the gash.

Detergents in the solution help remove dirt and fluxes from the metal. Acids in the liquid remove rust, scale, and oxides. The phosphate forms a mechanically weak but chemically strong coating that is quite inert but which absorbs paint, helping it hold to the metal.

Phosphate processes now take only a short time to complete. Based on about 1 minute if the phosphate solution is sprayed, or perhaps 2 min if the parts are dripped, the treatment line can be geared to run parts through in as little as 5 min. Usually a conveyor is routed through a series of spray tanks, which include a degreasing solvent, hot-water rinse, phosphating spray, cold-water rinse, and acidic rinse; then a hot-air dryer. After this, paint can be applied at any time.

If the phosphate is applied for in-plant storage, it can be easily removed when parts are to be processed again with a solvent, normally an alkaline solution.

Generally phosphates are applied as paint bases, and common practice is to run parts through the cycle just before painting. Some plants gear a complete spray-phosphating setup to production line, and dovetail paint booths right behind the phosphating line so parts can be finished continuously.

Dipping technique, either automatic or manual, is simple enough that even fairly small shops can install a few tanks to allow hand dipping, and larger plants can use automatic dip equipment if the range of parts sizes is not too great.

Phosphates are applied to iron and steel most widely, and probably the most important part of this classification is in preparing steel parts for enamel coating. Other metals that can be phosphated to advantage are aluminum (primarily to help bond the paint), zinc, and cadmium. Other metals can be phosphated, too, if paint adhesion is a problem or if an added protection against corrosion, in mild conditions, is required.

Organic finishes seal out atmosphere

"Paint" is one of the oldest and most versatile of materials for coating metal products to hold back corrosion. As with any coating, of course, the paint coat must be thick enough and permanent enough to keep out moisture, and it must cover all the surface of the metal that would otherwise be exposed to the atmosphere.

Aluminum can be anodized to produce a large variety of colors, and magnesium can also be anodized for color. Anodizing both metals improves the finish, by making it hard and shiny, instead of powdery looking, but anodizing does not particularly improve corrosion resistance because the anodized coating is quite thin, and both aluminum and magnesium form natural oxides that prevent corrosion anyway.

Although "paint" is a handy title, it is not accurate, for paint is but one of a number of kinds of organic finishes. Paint consists of pigment (color), plus vegetable drying oils. Enamel is pigment plus resinous varnish or modified heat-bodied oils. Actually paint and enamel overlap, and both contain some of the same kinds of vehicles. Varnish, which is not often used for metal products because coloration on the product is usually desirable, is a resin, natural or synthetic, dissolved in volatile solvent. Many of the now-available plastic materials are used in varnishes, so there are many different varnishes.

Lacquer is a material based on a resin plus a cellulose derivative. The resin may be shellac or a more modern plastic. Lacquer dries by evaporation of the solvent, which leaves the resin on the surface of the part being coated. Varnishes, on the other hand, dry as the solvent evaporates *and* the resin oxidizes, polymerizes, or both.

Some newer coatings

Almost any kind of organic finish can be applied to metal, but with varying results. The metal must be clean; and most often a primer coat of some sort should be used. Phosphate coatings and similar materials are often used. Red-oxide, red-lead, and zinc-chromate primers are others.

Enamels are now widely applied on products that must be covered during rough service. Enamels based on alkyd resins are durable, and can be produced in practically any color. Silicone-base enamels have good resistance to heat if the product requires this, and they are now available in a good range of colors.

Such plastics as styrene, teflon, acrylic, and vinyl

Checklist for aluminum finishes

MECHANICAL:
Grinding, buffing, brushing, sandblasting, and others produce surface finish that will meet requirement after surface has oxidized naturally. On products like kitchen pans, this is enough.

CHEMICAL:
Phosphates, alodine, anodizing with acids produce controlled oxides to whatever thickness desired. Anodizing uses chromic, sulphuric, fluoboric acid, electropolishing, followed by chromate or acetate dip to seal the film. Alrok also seals. Acids can be applied — oxalic, sulfamic, phosphoric, boric. Zincate is also plating base.

PLATING:
Copper, chromium, brass, nickel, tin, zinc, cadmium, silver, and gold can be applied.

ORGANIC:
Primers usually used, followed by paint or enamel, which take readily. Primers are zinc chromate, phenolic, alkyd-base. Temporary plastic coatings applied at mill to protect surface; stripped off later.

VITREOUS ENAMELS:
Fused at 920F for 5-8 min.

are now being incorporated in organic coatings. The trend in enamels indicates that it will not be difficult, in the future, to use coatings that will withstand almost anything the base metal underneath will take. Under these conditions, protection from corrosion is excellent, always providing the coating is continuous and has no pinholes or scratches from which corrosion can spread.

Lacquer finishes must usually be buffed to produce a high gloss and to even out the coating, but they can be dried rapidly in air; while enamels are usually baked. Colored lacquers are somewhat expensive, but the end result, in product appearance, is good. A recent development in hot-lacquer spraying may allow coating the material in thicker layers, which will reduce costs.

Another classification of organic finish is bituminous coating, which are asphalt or pitch-base materials. These can be used in the form so common — as tar coating for underground metal installations — and can also be converted into enamels. Usually they are used outdoors.

Underground service for iron and other metals, usually as piping, is unusually severe. Reactions in earth are somewhat different from those in an air atmosphere, but they should be mentioned.

Piping is often coated by wrapping it with paper or other fairly impervious material, then coating this with a bituminous product. There may be many overlapping layers, so the covering will last a long time. But eventually corrosion does set in.

Instead of digging up the pipe, many line companies install cathodic protection, usually without electrical current, but relying on natural current to force corrosive action to attack the anode instead of the piping, which acts as the cathode.

Cathodic protection

Air and water are not the only atmosphere that will allow electrolytic action to take place. Metal placed underground, such as pipelines, will corrode badly with the ground acting as the electrolyte for an electrochemical action between small anodic and cathodic spots or areas on the surface of the metal.

To counter this electrochemical action, metallic anodes are often placed underground close to the pipeline (or in a water tank, where action is similar) and electrical voltage (direct) is impressed between the anode and the metal to be protected. A wire is connected between them.

This forces the base metal to become cathodic, and the electrolytic action set up will blanket any natural corrosive action and prevent corrosion of the cathode — or base metal being protected. The anode, often magnesium, will corrode rapidly, and must be replaced periodically, but financial loss of the anode would be much less, and danger to the material in the pipeline or tank is much reduced, if the anode is used up.

Relatively few metalworking products are buried, but many of those that are can be sufficiently protected by this system.

Vitreous finishes stand heat

Porcelain enamels are coatings of fused inorganic materials; these may be oxides of antimony, zirconium, and titanium combined with silicates and other mineral products. The materials are melted together, then quenched to shatter the mass, and finally ground to the grit size desired. Thickness of the coating on metal can range from about 0.01 to 0.04 in.

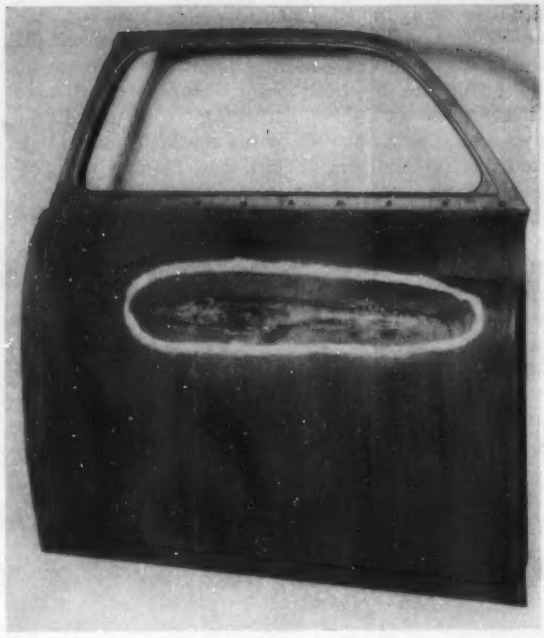
The frit binds mechanically to the surface of the metal and is permanently attached. It resists most strong chemicals, insulates against heat, and withstands thermal shock. Necessarily it is a good shield against metal corrosion because of thickness, density, and permanence.

Porcelain enamels can be applied to mild, stainless, and many alloy steels, copper, some types of aluminum, brass with zinc content, aluminum containing copper manganese, silver, and cast iron. They cannot as yet be applied to nickel.

Each formula of enamel frit fuses at a given temperature, and the metal must be raised to that temperature to allow the frit to fuse. Thus, if the fusing temperature of a given frit is higher than the melting or softening point of a given metal, that particular application cannot be made. However, there are some low-fusing-temperature frits that can be applied to low-melting-point metals, though higher properties come with high fusing temperatures and maximum protection cannot be given to all metals.

Colored porcelains are a fairly recent development that should allow applications to metal where the standard white color is sometimes objectionable or less desirable.

Under normal atmospheric conditions the properties of porcelain enamels are more than enough to protect metal from corrosion.



AUTO-BODY PANEL corroded badly in two years' storage, making it useless as replacement part. Doors were cleaned, coated with preservative oil, then stacked against wall in storage where atmosphere was not conditioned for low moisture. Door in front of this one rested against it where corrosion appears. Oil was not properly treated with corrosion inhibitors, so oily film broke down under physical pressure, letting rust start

Cladding puts up a metal shield

The major importance of clad metals is corrosion resistance, though some products are made of clad for economy, appearance, or physical surface characteristics. Some jewelry is clad silver or gold on copper, brass, or even steel, and copper clad on the bottom of steel kitchen pots increases heat conductivity.

Practically any metal can be clad onto steel, including Inconel, nickel, silver, aluminum, and even platinum, to name the most corrosion-resistant cladding materials. And stainless steel can be clad onto copper, copper onto lead and aluminum, and aluminum onto aluminum alloy (to produce Alclad) and magnesium. As necessity arises, the art of cladding is expanding, even though the process is fairly expensive and applications of some combinations are not frequent.

Clad is usually from 10 to 35% as thick as the base metal, or more if the sheet is double-clad. It can be machined and finished mechanically providing you don't pierce the clad metal. Clad metal is just as corrosion-proof as the cladding material because of the thickness of the cladding and because the cladding is applied by hot rolling and is permanent.

The only weak spot in a clad finish might be the edge of a sheet — where the base metal is exposed, and where electrolytic action between the two metals, depending on which they are, might accelerate corrosion beyond the normal corrosion rate of either metal. To prevent this, the product should be designed so edges are rolled or bent under, or butting plates are welded with filler rod of the clad metal.

Any hole through the cladding invites trouble, if the metal product is to be exposed to a corrosive atmosphere. If assembly is necessary, and the conventional method would call for bolts or rivets, metal screws in blind holes in the base metal from the inside should be substituted. Interior welds do not usually cause trouble, unless the cladding material has a much lower melting point than the base.

If through-bolting is essential, fasteners should be made of the cladding material, and the top of the fastener and the hole should be sealed — with an organic material, or by welding.

Although cladding is a costly process, it is often cheaper than applying solid sheets of the corrosion-resistant metal that should be used. In some applications the amount of cladding metal can be quite small. In most cases, purity of the cladding material has high importance.

One warning is important if clad metals are to be rolled, bent, heat-treated, and otherwise fabricated. If the core metal is strong, the equipment and techniques to work the clad must be designed for the core metal. But a relatively soft cladding metal can easily pick up inclusions in its skin if the equipment is not kept clean—a point not so essential when working raw base metal.

This is particularly important if the cladding is copper, silver, or some other material that should be of high purity and is soft in comparison to the base. It is also important during rolling and heat-treating or other furnace operations. If the surface is to resist corrosion, it cannot include particles of the base metal, left over from an earlier run. The high corrosion resistance that results from careful handling is worth the care.

Plating is a big answer

Electroplating has gone through a long process of refinement over many years. Metals that can be plated onto base materials that do not resist corrosion too well include most of the inert metals.

Copper is plated for appearance onto steel products, but is more often plated onto steel as a base for nickel, which is covered by chromium in conventional chrome plating. Nickel resists corrosion, but not physical wear, which is part of the reason that chromium is plated over the nickel. The other reason is chrome's ability to hold a polish. Chromium also has a good blue-white color, but in many applications the chrome plating is so thin it adds practically nothing to appearance, except shine, and it is the zinc that imparts the light color.

Cadmium, tin, lead, brass, and even iron are plated onto steel products; and rare metals are also plated — though usually for appearance. Indium is sometimes plated onto lead bearings to protect the lead from acids in lubricating oil.

A recent development is gas plating, in which metal carbonyls are deposited on base metal in a furnace without use of electric current. The most common plating metals can be applied this way.

Continuity is important enough with most methods of coating metals to prevent corrosion, but with plating it is critical. With a base metal and plating metal that have strong reactance with each other, any break in the coating may cause corrosion at a high rate. Tin plating on steel, for example, helps the steel corrode if atmosphere gets through the tin. On the other hand, a zinc coating takes advantage of this fact in that the zinc will corrode when the steel or iron is exposed, and will tend to protect the base while it is eaten away itself.

A process akin to plating is hot dipping, with which zinc or tin are applied to sheet or wire iron and steel, by dipping them in a molten bath of the softer metal. This produces galvanized sheet, and results in a sheet of steel covered with iron-zinc or iron-tin alloy right next to the base metal, with purer zinc or tin on the outside. Hot-dipped sheet is protected from corrosion directly proportional to the thickness of the coating.

Sprayed metals are permanent coatings

Metal spraying, where metal wire or powder is melted in a gas flame and propelled by compressed air onto a metal surface, provides protection of inert metals at low cost. Actually, some metallized coating are not really permanent if the coating is broken through, for such anodic metals as aluminum, cadmium, and zinc will suffer sacrificial corrosion in the presence of iron or steel, on which they are often sprayed. As long as the coating is continuous, just as with a plating, corrosion protection is good if the sprayed metal is not easily corroded.

Because anodic metals corrode before the base metal is attacked, sprayed coatings can be made quite thin, and even if they are porous, will protect the base metal though they may corrode themselves.

Metallized coatings may be applied to the base metal of a product, then paint, enamel, or lacquer may be applied. In this case, the sprayed coat can be as thin as 0.006 in., though a sprayed coating that will not be painted should run from 0.010 to 0.015 in. thick.

Metals that do not protect the base material by sacrificial corrosion—that is, they will not corrode if both the coating and base are exposed to the atmosphere—are applied thicker. The sprayed coating must be impervious in this case, and it may be 0.025 to 0.030 in. thick. If the coating is punctured, the base metal will corrode first, and maximum protection must be provided.

Normally only tin and lead are applied in these thicknesses over iron and steel. Thin coatings can be sprayed with aluminum and zinc.

Applications of metallizing take in much more than corrosion protection, so in many cases corrosion will be a secondary problem. Metallizing is suitable for hard-facing a metal without processing it in heat-treating furnaces—and metallizing allows hardening the surface of a metal even if it will not heat-treat.

Corrosion protection of a metallized coating is probably not quite as good as a plated coating of the same thickness, but the process is economical, can be made partly automatic for high production, and does not require extreme purity of the metals involved. The reason why metal spray sticks to a base metal is partly because of mechanical interlocking between particles of the base and the coat, and partly because the oxides of both metals cement together.

Vacuum metallizing, a newer process applied for adding metal coats to plastic products, may have some future application. So far, mirrors have been metallized with aluminum in the vacuum process.

Petroleum products carry inhibitors

Oils and greases have been applied to metal products for many years to help prevent corrosion. Oil added to a plain metal surface affords some protection, as long as it stays put and as long as it maintains its original chemical balance.

Oils can also be applied to oxide finishes, which they reinforce. Some kinds of oils can be applied to a metal product to prevent corrosion, and will also provide a base for paint or enamel. Other oils can be applied over rust, and, it is claimed, will remove the rust and prevent its later formation.

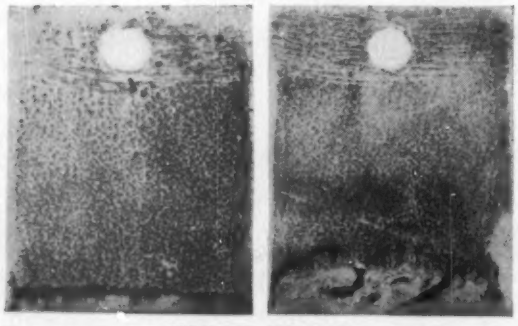
But oils alone are only a fairly good method of preventing corrosion. A given pure oil will cover a metal part and keep out air and water, which combine to corrode the metal, only for a limited time. This protection depends on the oil maintaining its original chemical balance, and also its original film over the metal. Normally oil will float on top of water, and if water does get between the oil and the metal, trapped free oxygen in the water will allow electrochemical corrosion.

Polar materials

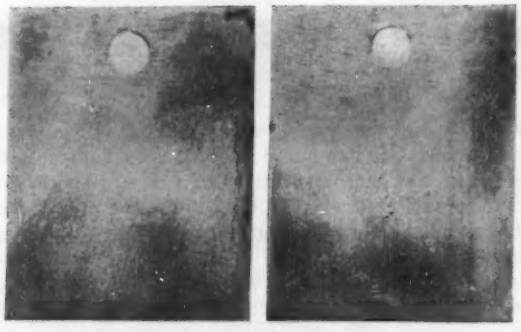
Above are conditions that usually exist with pure oil, without any additives specifically developed for corrosion resistance. When corrosion-preventing materials are added to the oil, the resistance of that oil will be increased greatly.

Polar compounds, also called moisture-displacing or surface-active agents, are complex chemical compounds, made from oil products or other chemical sources, or both, to stick to the metal. Usually they are quite oil-soluble—or have a high affinity for oil—and are carried in a light-oil base; often called slushing oils. They also have a high affinity for metal, and disperse toward the outside surfaces of the oil film, or glob of oil, no matter what shape, and insert themselves between the metal and oil.

These materials are moisture-displacing agents in that they are attracted to metal strongly enough that they will squeeze the water out, pushing it to

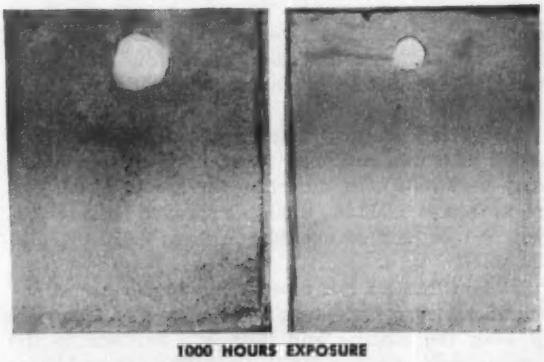


300 HOURS EXPOSURE



300 HOURS EXPOSURE

TEST PANELS ARE SOFT LOW-CARBON STEEL, punished in 100%-humidity, 100F atmosphere. First pair were cleaned, then coated with light oil. Second pair were cleaned, coated with light oil and polar corrosion inhibitor. Both pairs were taken out of test after 300 hr. Third pair was treated with polar material at double strength, lasted 1000 hr



1000 HOURS EXPOSURE

one side or forcing it up through the oil to the surface of the oil film. They are surface-active agents because they go automatically to the surface of the oil. They are not wasted within the oil, where they could do little if any good, but go to the metal surface under the oil.

This action pushes water out and prevents corrosion, because, without water, corrosion cannot normally occur—at least on iron and steel.

How long?

These polar materials are not permanent, partly because the oil itself will eventually let water seep in, and partly because the polar materials themselves gradually lose effectiveness. The lighter the oil in which the polar materials are immersed, the less permanent will be the protection afforded. However, the oil must be light in character to allow the polar materials to work; therefore, polar agents will be found only in light oils.

Two kinds of fingerprint treatments...

Body acids leave a liquid deposit on metal, but a crystalline material forms as the liquid evaporates. This crystalline material is what corrodes metals.

If it is applied immediately after the fingerprint is made, a polar oil will replace the body acid on the metal, and will give protection against further handling. But once the crystals are formed, they can go on corroding the metal. Polar oils will suppress corrosion, but will not stop it completely.

For old fingerprints, acidic liquids are applied to combine with the crystals. These materials are not good protection later, because the acids that take up the fingerprint crystals can attack the metal, too. Such removers should themselves be removed, and the metal should be immediately protected against further corrosion.

Vapor inhibitors for packaging

Temporary and semi-permanent storage are served by a fairly new product, called vapor corrosion inhibitor. This chemical is based on sodium nitrite's ability to inhibit corrosion in the presence of oxygen-bearing water on ferrous metals. Complex nitrite salts that will release nitrite ions in contact with water are available as solid salts, in bomb sprays, and most generally soaked into wrapping paper.

Action is volatile; that is, the material will evaporate from the paper when exposed to air, and will fill the inside of the package and deposits lightly on metal parts inside. If water is present, the chemical will dissolve in it and inhibit corrosion as long as it is active. If steel parts are degreased and neutralized carefully, little water will be present and the chemical may last upwards of a year in a light container —longer if the container is air-sealed.

The chemical can be carried in paper backed with a plastic film, which insures longer corrosion protection because of the air seal. Generally VCI, also called Vapor Phase Inhibitor and VRI, is best only for steel and iron. On copper it may form a darkened product, and contact of the paper itself with some other metals at high temperatures causes discoloration. Aluminum is not affected.

VCI-wrapped packages may be opened briefly for inspection, but must be closed immediately or the gaseous chemical will disapper. It is heavier than air, and if extra torn or shredded paper is placed inside the package, as is recommended if openings inside are wider than 12 in., it should be nearer the top of the package.

If desired for extending storage time, light oils may be left on the metal parts enclosed, although they are not usually necessary.

Desiccants

Anhydrous chemicals that absorb water from the air, such as are used inside plastic-sprayed cocoons, are called dessicants. These materials are also useful in closed storage spaces of any kind where metal is stored for long periods. Desiccants can usually be identified if used up by color, but if the storage space is opened and new air allowed to circulate within, new chemicals are required.

The chemicals can be placed in the bottom of a wooden shipping case, or similar enclosure that is sealed against air entry. By absorbing and reacting with water vapor in the entrapped air, they prevent corrosion by eliminating the electrolyte.

Other coatings have uses

Plastic materials that can be sprayed onto metal surfaces have a good future where dimension of the metal product is not critical. The mothballing technique, used by the Navy, provides a plastic coating that seals out atmosphere and prevents corrosion—providing the atmosphere within the cocoon is dehumidified. Chemical salts with affinity for water are placed inside to take up free moisture.

Plastics sprayed or dipped onto metal parts—the peelable type—are also in wide use, particularly for coating tools and cutters during travel from the factory to the user's shop. If the parts are cleaned well before being sprayed or dipped, the plastic prevents corrosion by sealing out air.

Another material that helps prevent corrosion is wax, sometimes applied to oxide finishes on iron and steel parts. Wax improves the appearance, and helps seal the oxide surface.

Among many specialized products for sealing off metal surfaces are polyethylene films—in tape form—that can be wrapped. Even Saran-Wrap might be useful in some cases.

Emulsifiable oils hold off rust

Soluble oils, which are not really soluble in in water but form an emulsion, can protect against corrosion on iron and steel to some extent. Such protection is temporary because eventually the emulsion breaks down, the oils deteriorate, and free water develops.

Aqueous-phase is another term for emulsions of oil and water. Most emulsions of this kind act to prevent corrosion by cleaning metal—they can be made to have high detergency value. If there is water on the work, the emulsion picks it up and lessens chances of corrosion in that way, too. Water vapor that would threaten corrosion is either excluded by the emulsion or is taken up by it.

Soluble cutting oils for cutting can be treated to prevent corrosion, but should be kept as clean as possible with the usual filtering methods applied to emulsified coolants.

Greases for long-term protection

Heavy petroleum products like the famous Cosmoline are still applied to machinery and parts where long storage time is in view. The thicker the coating, the longer a petroleum product will exclude air and moisture.

If the grease is heavy enough and chemically inert, it can last many years in a closed container around metal parts, and will protect the parts from corrosion.

Greases are normally not compounded with corrosion inhibitors, though pre-treatment of the parts, after being cleaned, may call for a polar thin-film oil.

Light greases, heavy oils, and petroleum products in general all have some corrosion-inhibiting properties, partly depending on how easily they "wet" metal surfaces. They are penetrable by water eventually, but their physical properties and chemical bonds determine how long they will last without admitting water. In general, petroleum products are good for economical and easy short-term corrosion protection, and for long-term protection if they are specially compounded and chosen for such service.

We would like to express our appreciation for technical and descriptive material for this report from the following organizations:

American Chemical Paint Co
American Lubricants, Inc
Angler Sales Corp
F E Anderson Oil Co, Inc
Bettinger Corp
Cromwell Paper Co
Gulf Oil Co
D W Haering & Co, Inc
Harco Corp
E F Houghton & Co
International Nickel Co
S C Johnson & Son, Inc
Kano Laboratories
Keystone Lubricating Co
Lion Oil Co
Haas Miller Corp
Mitchell-Bradford Chemical Co
National Assn of Corrosion Engineers
Nopco Chemical Co
Nox-Rust Chemical Co
Nuodex Products Co, Inc
Oakite Products, Inc
Orchard Paper Co
Parker Rust Proof Co
Pennsylvania Refining Co
Rust-Oleum Corp
Shell Oil Co
Socony-Vacuum Oil Co
Standard Oil Co of California
Stop-Rust Co
Sudbury Laboratory Valvoline Oil Co
The Texas Co
Van Straaten Chemical Co
Whitfield Chemicals Co
Wilbur & Williams Co

Round Table

Blueprint for error

"Who's responsible for making sure blueprints are legible, Ed?"

"Why, I suppose the checker in Engineering is; why?"

"Well, it's a long story, but it sounds familiar to me. We just turned out two dozen large shafts that won't fit their bearings, and I'm frankly looking for an out."

"If the blueprint was illegible, why did your machinist go ahead with the job?"

"I don't know, Ed. It was Mullins, and you know how he is. He claims one dimension looked like 5/16 in., and he didn't want to 'bother' me with a little detail like that. Of course, it actually was 3/16 in.; so all the shafts are scrap."

"That's great, Al. You may get orders to fire Mullins for that. He should have known better than to cut the shafts if he wasn't sure."

"The trouble is, we had the same job a few months ago, and Ferguson got it that time. Same print—and just as unreadable. But Ferguson scaled the print and guessed right—3/16 in. Now Engineering is liable to ask why we had trouble this time when we didn't then."

"You know, we really ought to have some way of getting back at Engineering for the sloppy prints they give us, among other things that aren't right."

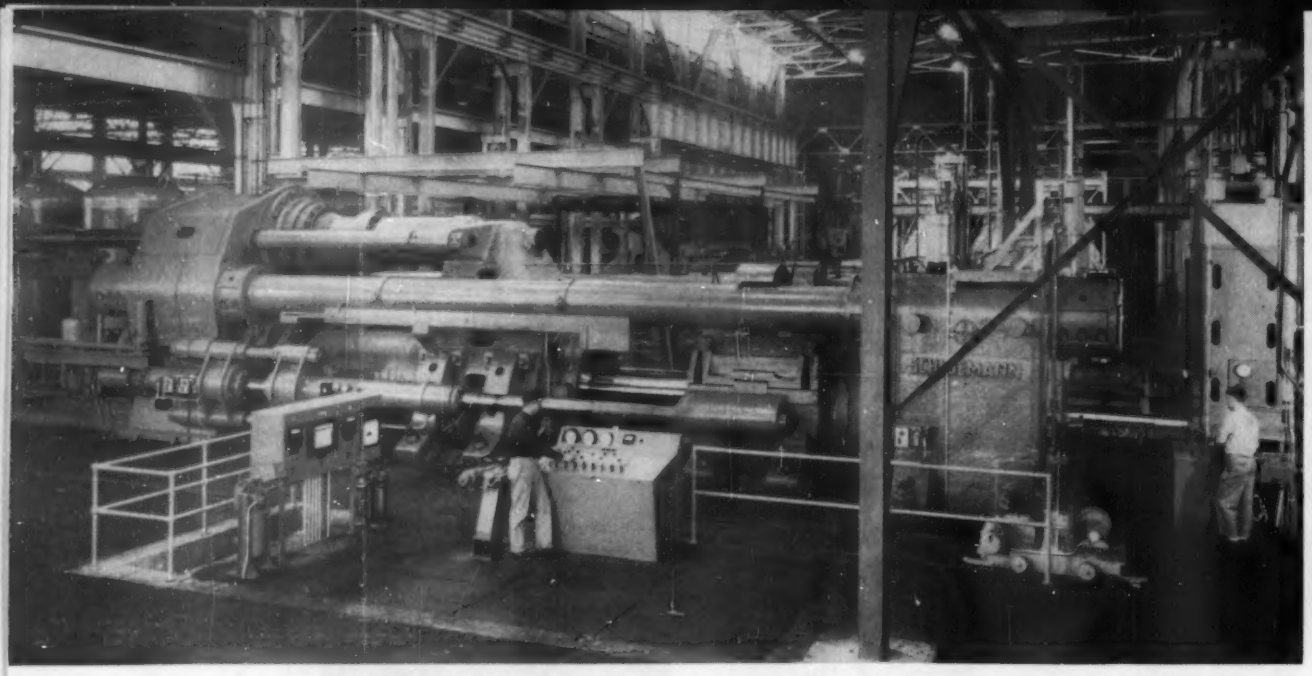
"Sure, Ed; but if you depend on the men to bring these problems to your attention, you wait all year. Then you get slapped in the face with a mess like this shaft business. It has to be an automatic method. One foreman can't do all the thinking for all the people in his department."

"Maybe we ought to have a conference once in a while. Write down the gripes, and keep a list. Then present them when department heads get together."

"It's hopeless in a foremans' meeting, Ed. All we do there is listen to company policy and get bawled out. Maybe I'd better just go upstairs and see, the design engineer."

"He'll bite your head off, Al. Better see if you can make the complaint official."

***WHO IS** to blame when workers make errors because of bad prints? Should the shop refuse any prints that aren't big, easy to read, and void of confusing symbols? Is there a foolproof method of getting shop complaints back to the general offices? Your ideas may help others. Discussions of earlier topics appear on later pages.*



TWO TO FOUR TIMES THE SIZE of any previous extrusion press, this 14,000-ton unit will extrude aluminum-alloy sections weighing up to 2500 lb. Made by Schloemann, AG, of Dusseldorf, Germany, it is of 3-ram, 4-column design and can be operated as a 4,700-, 8,300-, or 14,000-ton unit. It thus can on occasion use tools that cannot be built strongly enough for its full capacity. It is part of the US Air Force heavy-press program

Special tools support 14,000-ton

Largest extrusion press to date must be aided by auxiliaries that are just as impressive. Here four of them are shown to indicate novel designs, tremendous size, and efficiency of this new Air-Force-sponsored installation

W C WINTER, works manager,
Lafayette (Ind) Works,
ALUMINUM COMPANY OF AMERICA

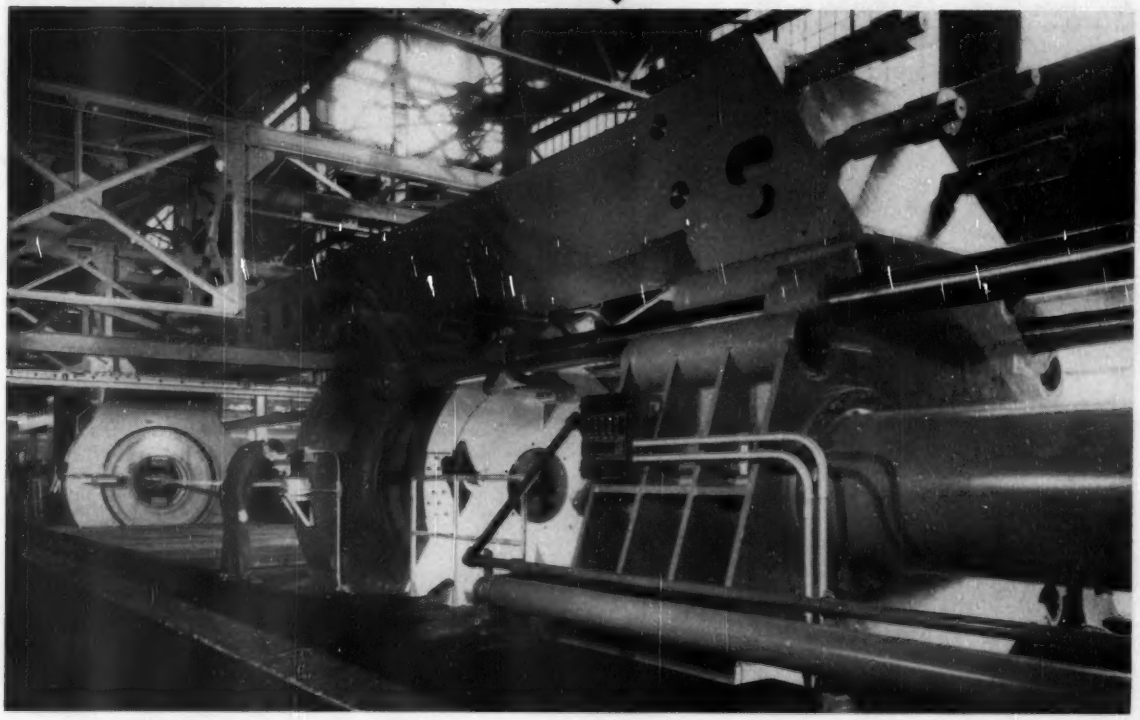
BACKUP BLOCKS FOR EXTRUSION DIES range from 8 to 26 in. thick and 25 to 42 in. OD, and are made from the same steel as the extrusion dies. Split dies (left) make step extrusions for aircraft wing spars. Extrusion tools are preheated prior to use with low-frequency induction coils, each capable of heating tools up to 50 in. OD and 28 in. thick. A large gas-fired holding furnace with three compartments holds heated tools at proper temperature after induction heating. Controls maintain temperatures within close limits

THESE 26-IN. OD die (right) and support (left) plates are used in the Schloemann press to extrude in V form rib-stiffened lengths that later are flattened to form wide panels for an airframe. Both are annealed (R_c 12-20) hot-work tungsten-chrome-moly steel. Composition: W-1.25%, Cr-5.00%, Mo-1.50%, C-0.35%, Si-1.0%, Mn-0.25%, V-0.25%

EXTRUSION CYLINDERS, weighing as much as 57 tons each, are interchanged in the press to hold ingots of different diameters. Bores range from 15¼ to 29¼ in. Cylinders are moved to and from the press with 100-ton capacity overhead crane also used for press maintenance

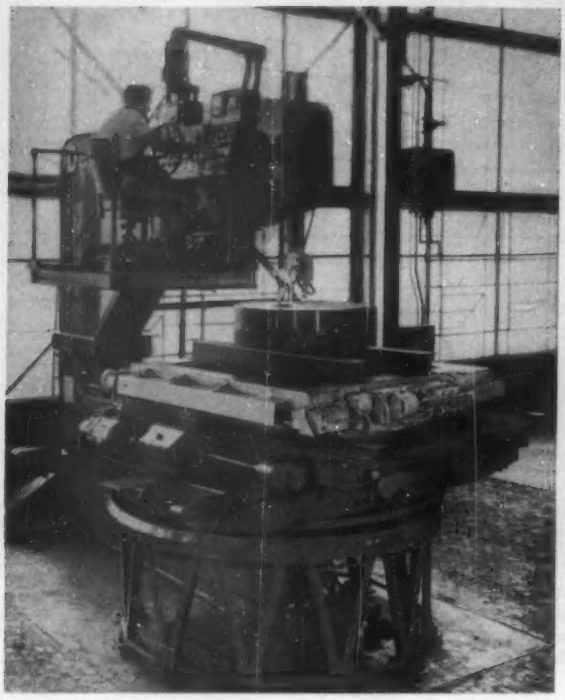
extrusion press

FOLLOWING SOLUTION HEAT TREATMENTS, extrusions from the press usually are stretched in this Alcoa-designed 1500-ton stretcher. It can handle a 120-ft 75S extrusion up to 37 in. wide, as large as 60 sq in. in cross-sectional area. Extra safety allowances are built in, because there would be an instantaneous release of as much as 17 million in.-lb of kinetic energy if an extrusion should break under maximum tension. AISI 4140 jaw blocks (heat-treated to 275-325 Bhn) for the unit are cut in the saw shown later



Tools for 14,000-ton extrusion press . . .

continued



DIE PARTS 4 to 26 in. thick are bandsawed in this DoAll Contour-matic with the same accuracy as smaller parts are cut in a conventional unit. Largest thus far made, it is 15 ft high, weighs 16,000 lb. HSS saw bands are 40 ft long, 3/32 to 1½ in. wide, run at 50 to 2000 rpm by 3-hp motor. All functions are power driven and electronically controlled from an adjustable platform beside the machine head. Work is placed on parallels across the 52 x 52-in. working-area opening in the upper of two independently driven parallel frames or "tables" on precision ways which travel at right angles to each other. Tables are supported on a rotary table power-driven at 0 to ¾ rpm. Power feeds for the two upper tables are electronically interconnected so the vector of their combined feed rates is adjustable from 0 to 32 ipm. Work always moves directly toward or away from toothed edge of saw

ALMOST ANY REQUIRED CONTOUR can be followed, narrow bands being required for small radii, as on conventional machines. Usual cutting rate is about 1 sq in. per min (8-in. piece would be fed at ⅛ ipm). Band width, work thickness and condition, guide spacing, pitch and sharpness of teeth affect permissible feed rate, as well as finish of the cut surface. Typical cutting rates are:

Workpiece Material	Thickness (Inches)	Cutting Rate (Sq in./Min)	Blade Speed (Fpm)	Feed Pressure (Pounds)
Hot-Work Tool Steel (Annealed)	7	1.0	150	60
Hot-Work Tool Steel (Annealed)	13	0.8	130	60
AISI 4140 Steel (275 - 325 Bhn)	18½	0.7	80	40

SETUP AND OPERATING CONTROLS are in a console before operator on adjustable platform on the machine column. Workpiece movement is controlled by handwheel, while gages and electric meters indicate cutting conditions. Tachometer shows band speed, pressure gage shows band tension (generally set at 30,000 psi approx). An electronic strain gage, coupled to the band guide above the work, measures, and limits if necessary, applied feed pressure. Meter, to which it is connected, shows feed rate in ipm. Operator selects feed rate and sets a movable contact on the meter 20% above this. Then, if feed pressure exceeds this overload, the meter needle touches the contact and stop feed until the saw cuts itself free and pressure drops. A red light shows stopped feed. Too-frequent stoppage indicates too high a feed rate for the job or a dulled blade

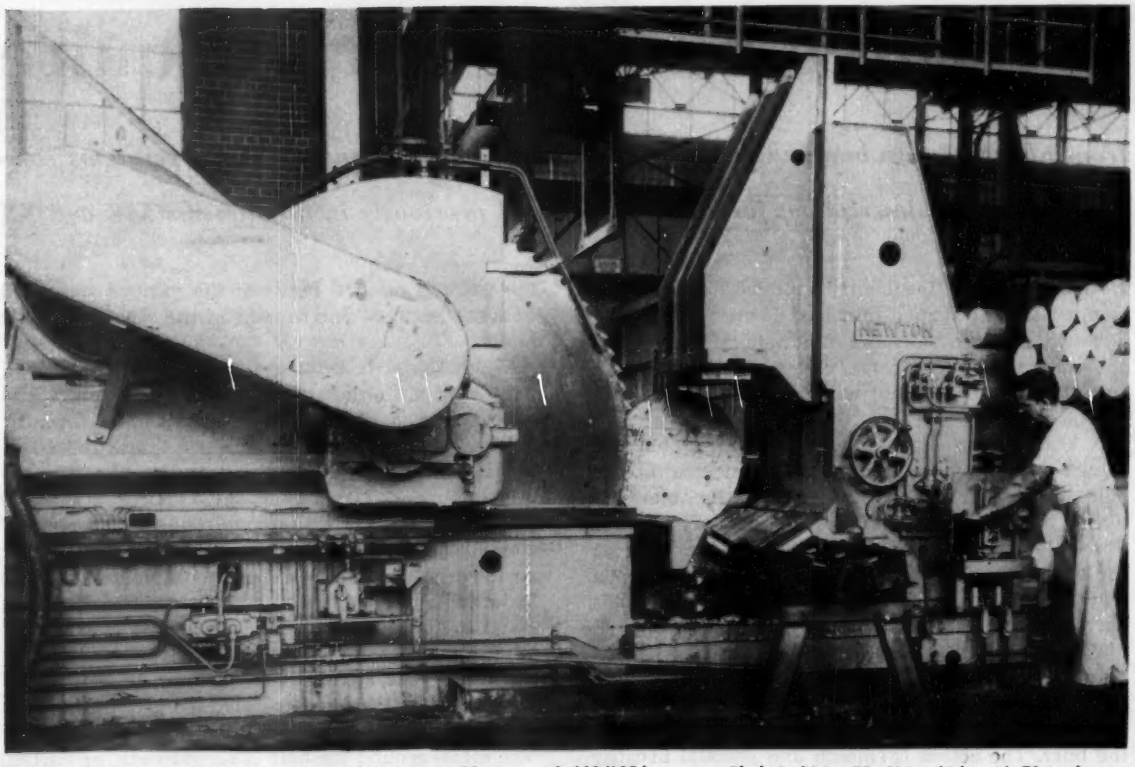
DISTORTION-FREE MIRRORS provide a "periscope" through which the operator watches the saw band and scribed line. Saw band is cooled and lubricated by mist of 50-1 soluble oil produced by aspiration. Air blast also clears scribed line so operator can stay within 1/32 in. of it. Band-tension limit switch on band guides is actuated only when band is taut, shuts off motor automatically if saw breaks. Work is usually so heavy it does not require clamping

LARGE DOALL DIE FILER finishes bearing (not-relieved) surfaces in an extrusion die with straight No. 1-cut machine files. Files 9 to 23 in. long may be used. They may be flat, crochet, half-round, or round parallel, but are usually No. 1 cut because finer cuts load rapidly. Diameter of working area in table is 30 in., throat capacity 38 in., work thickness 19 in. max. Double-hinged support arm is easily moved by hand. Finish attained on hot-work tool steel is 15 to 20 mu in. rms. A jet of 10-psi compressed air across the top surface clears it of chips. Filer is driven by a 2-hp motor, with speeds infinitely adjustable from 50 to 350 strokes per min, limited by stroke length, which can be set from 0 to 9 in.

OTHER EQUIPMENT

The new die shop for the 14,000-ton press has a number of larger-than-usual machine tools. They include:

- 96-in. Blanchard surface grinder
- 32×180-in. American engine lathe
- 5-ft Carlton radial drill
- Cleereman layout drill
- Rockford vertical hydraulic shaper (large)
- 64-in. Bullard Cutmaster VTL
- 2 large Cincinnati Hydro-Tels
- 10-in.-spindle Asquith horiz-bar boring, drilling and milling machine



INGOTS ARE CUT TO LENGTH in a special Newton cold saw with 100/125-hp motor. Blade is 96 in. OD, ¾ in. thick, with 72 teeth, runs at 60 to 180 rpm. It can saw billets up to 37 in. OD. Hydraulic carriage feed is adjustable from 1 to100 ipm. A second similar machine handles finished extrusions

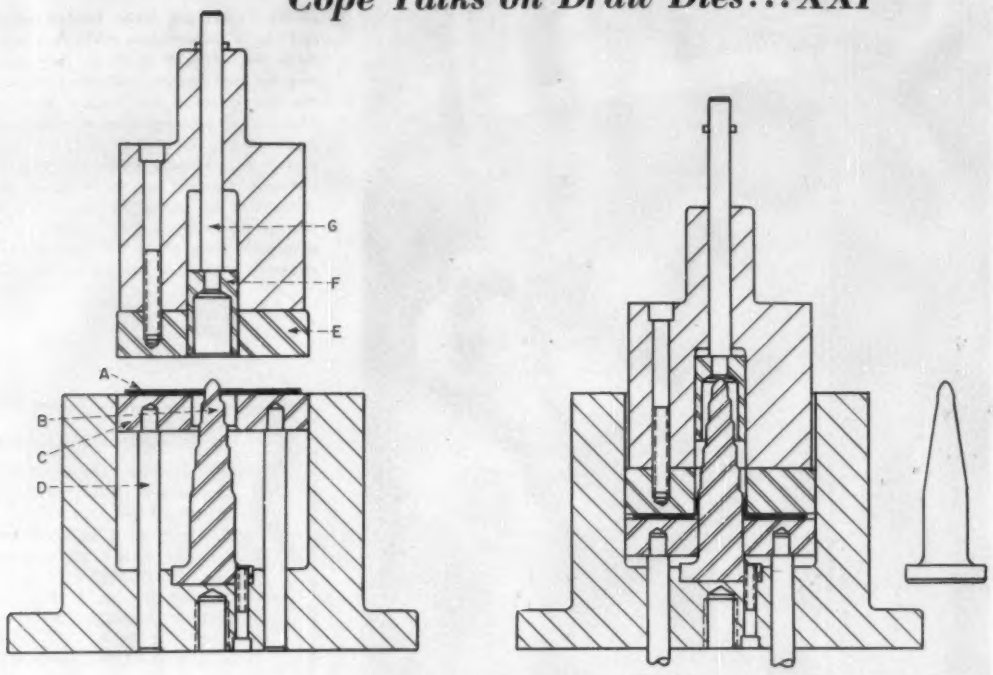


Fig. 1 . . . A stepped punch gradually turns back the metal around a hole, but the longer press stroke required limits usage to ironing burrs of say 1¼-in. dia maximum

Three kinds of burrs require

Ironed burrs, drawn burrs and burrs combined with forming and drawing operations complete the tooling descriptions for burrs, as discussed previously in installments XIV and XX

Ironed burrs are frequently produced either with stepped or ball-shaped punches. These punches reduce wear on the tools and eliminate "pick up" and subsequent loading of the die, thereby producing smoother, more accurate work with a minimum of trouble.

A burring die that employs a stepped punch is shown in Fig 1. To withstand severe stretching, the hole in the blank is reamed before the blank is placed in the die. Operation of the die is as follows: The hole in blank *A* is placed over the pilot at the top of burring punch *B*, as shown in the open view. The work rests on pressure pad *C*, which is normally held in a raised position by pins *D*.

When the slide descends, burring die *E* grips the blank against the pad and then forces blank and pad downward. During this action, the burring punch turns the metal back around the hole to form the burr. The action is smooth and gradual because the work is divided between the various steps and does not occur at one time as in the case of a single punch.

When the slide returns to the top of the stroke, pad *C* strips the burred blank from the punch, and the work is carried up with die *E*. It is ejected near the end of the stroke by knockout *F* and rod *G*.

Stepped punches are limited more or less to producing burrs no larger than, say, 1¼-in. dia, because of the long press stroke required. The number of steps may vary and is largely dependent upon the stroke of the press. Each step should be long enough to form its portion of the burr before the next step starts to form. Conical punches, shown at the right of Fig 1, are sometimes used but they are not as satisfactory as stepped punches.

When a ball is used to form a burr, the pierced blank is placed in a nest located on a pressure pad. The metal around the hole is turned back, or burred, by forcing the blank over the ball, as shown in Fig 2. Open and closed views of the die are shown.

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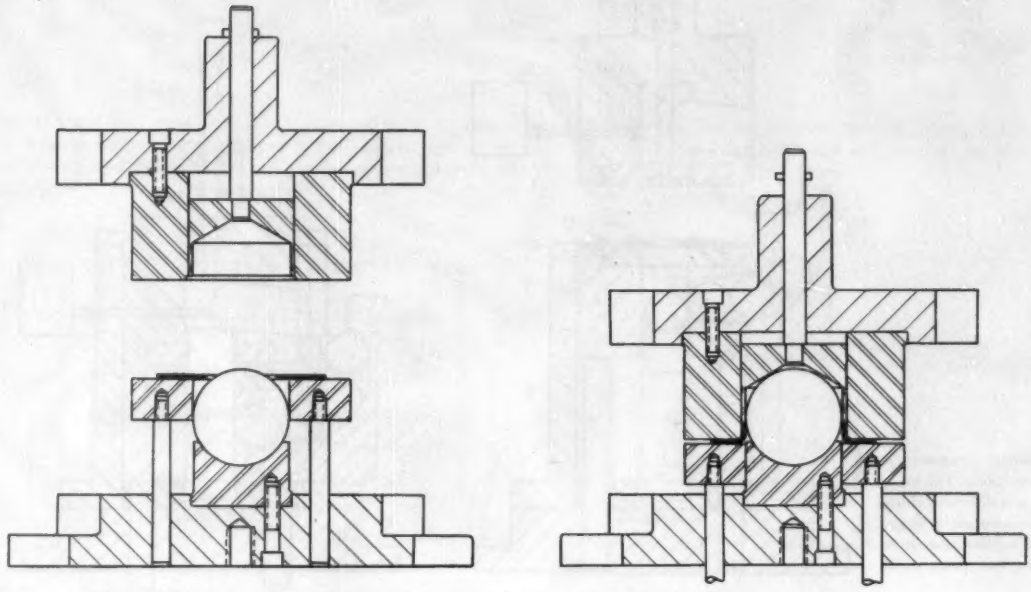


Fig. 2 . . . Forcing the pierced blank over a ball burrs the metal around the hole

different dies

STANLEY R COPE, president, ACME SCHOOL OF DIE ENGINEERING, SOUTH BEND 1, IND

The ball rests on a hardened tool-steel post, which is cupped to provide a seat. When the ball has passed through the work, it rests on top of the newly formed burr. The ball is ejected from the die, together with the stamping, by a positive or a spring knockout. The ball is then dipped in ordinary machine oil and is placed back in the die. A new blank is placed in the nest and the operation is repeated. Any number of holes of any size may be burred in the same operation by providing additional balls and holes in the die.

AUTOMATIC BALL RETURN

When many pieces are to be produced, and the balls must be returned automatically to the top of the stool, a die similar to that shown in Fig 3 may be used. Operation of the die is as follows: Blank *A* is placed in ring *B* and rests on insert *C*, which is set into the top of pad *D*. Pad *D* is normally held in a raised position by pins *E*, as shown in the open view. When burring die *F* descends, it grips the blank and forces it downward over ball *G*. Ball *G* rests on stool *H*. When the ball has passed through the work, air-operated plunger *I* pushes it into the passageway in the side of the punch-holder and it rolls into the chute in pad *D* to await its turn to drop back on top of the stool.

When the slide rises, plunger *I* returns to its normal position and the work is carried up in die *F*. The work is ejected near the end of the stroke by knockout plate *J* and rod *K*. Spring *L* is provided to hold the knockout up out of the way when the slide is down, so it will not interfere with the operation of plunger *I*. If the outer walls of the burr are tapered, a knockout may not be necessary, provided that the stamping is heavy.

Punches and balls for forming ironed burrs are subject to considerable friction and become heated quickly. For this reason they should be made of ground and polished high-speed steel and subjected to a four-hour "Ferrox" treatment. Ordinary machine oil should be used for lubricating burring dies.

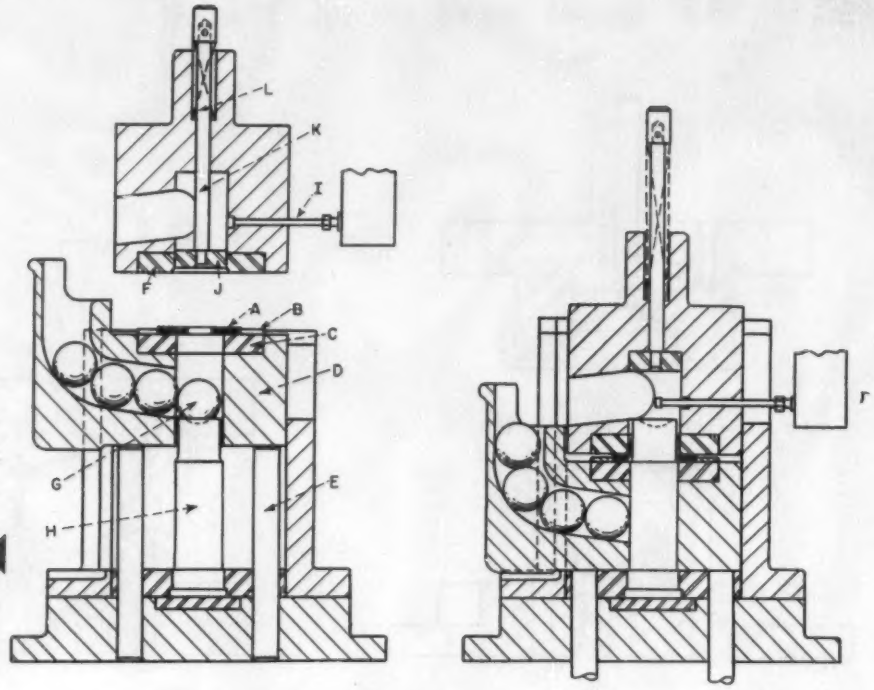


Fig. 3 . . . Faster operation is secured by equipping the burring die with a ball-return chute and an air-operated plunger that kicks the ball into the chute after the burr has been made

DRAWN BURRS

Drawn burrs are produced by three different methods. These are shown in Figs 4, 5 and 6. The choice of method depends upon the size of the burr (diameter and height), the stock thickness, and the relation (or difference in size) between the burr and the blank.

If the burr is large and has considerable depth, metal is drawn from the outside of the blank in one or more drawing operations into a shell having a diameter equal to that of the burr. The top of the shell is then pierced and the metal is turned back to form the burr, (Fig 4). Two precautions must be taken in preparing the shell for the burring operation. Radius R must be at least $4\frac{1}{2}\ t$ to permit forming the burr without thinning the metal or leaving a ring or a groove inside the shell as shown in the small view at the right. The piercing punch must be of a diameter which is equal to or less than the flat distance across the top of the shell. If the punch is allowed to cut into the rounded corners of the shell, the top edge of the burr will not be at right angles to the wall.

In order to produce a smooth, accurate diameter, the dies which burr the tops of drawn shells are usually also arranged to size the shell.

Shells less than ¾-in. dia are difficult to pierce and burr without leaving a groove inside and an uneven top, if drawn to final diameter before burring. For this reason, the hole should be pierced in the shell that precedes the final drawing operation. The shell can then be reduced to its finished diameter and burred in the final operation (Fig 5).

Suppose the stock is thick and the burr is too small, in relation to the diameter of the blank, to draw metal in from the outside. In this case, a shell with large radii and considerably larger than the burr should be stretched from the sheet and turned inside out to form the walls of the burr (Fig 6). The metal is reduced in thickness appreciably in the first operation. By turning the shell inside out in the second operation, instead of reducing its diameter by ordinary methods, the metal is prevented from thinning further.

HOW TO COMBINE BURRING AND DRAWING

Burring operations can often be combined with forming or drawing operations, as shown in Figs 7 and 8. In both dies the outer edges of the blank are drawn and the center hole is burred. The pierced blanks are prepared in compound dies.

In the die shown in Fig 7, the blank is located over pilot A and rests on pressure pad B. Pad B is normally held flush with tops of die ring C and burring punch D by pins E. When the slide descends, the combination drawing punch and burring die F pushes the pad down into the die to form the blank. When the slide rises, pad B returns the blank to the top of the die and the work is carried up with punch F. The stamping is stripped from the punch near the end of the stroke by spider knockout G. The knockout is arranged to strip the drawn and burred portions of the stamping simultaneously, to prevent distorting the part.

When the stamping is of such a shape that it is necessary to form the outer flange almost completely before the burring operation starts, as shown in Fig 8, pilot A should be placed in the upper half of the die. The blank is located (approximately) by gages

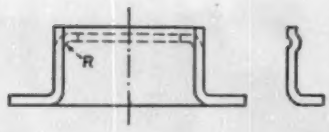
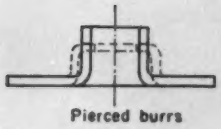


Fig. 4



Pierced burrs

Fig 5

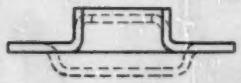


Fig 6

Figs. 4, 5 and 6 . . . Drawn burrs are produced by three methods: (1) drawing the burr into a shell of suitable height, then piercing and turning back the metal; (2) piercing the next-to-last shell, then reducing the shell and burring, and (3) stretching a shell in thick material, using large radii, and then turning the shell inside out

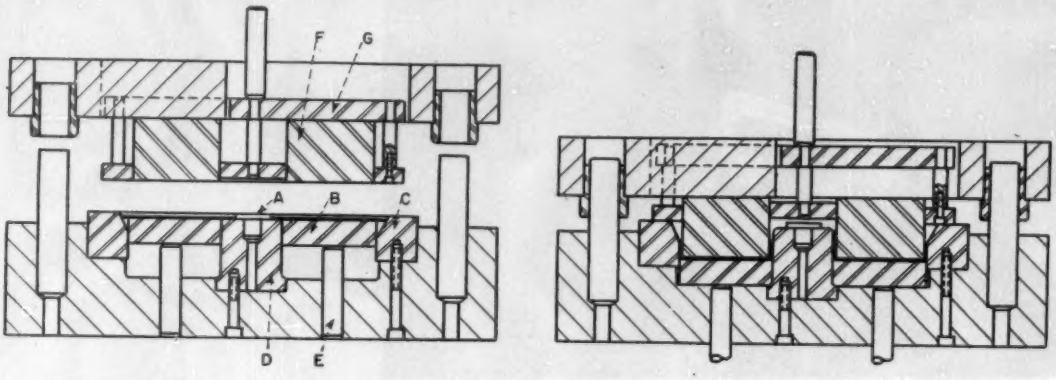


Fig. 7 . . . A pierced blank is formed into a large diameter burr at the center and the outer edge is drawn into a shallow flange

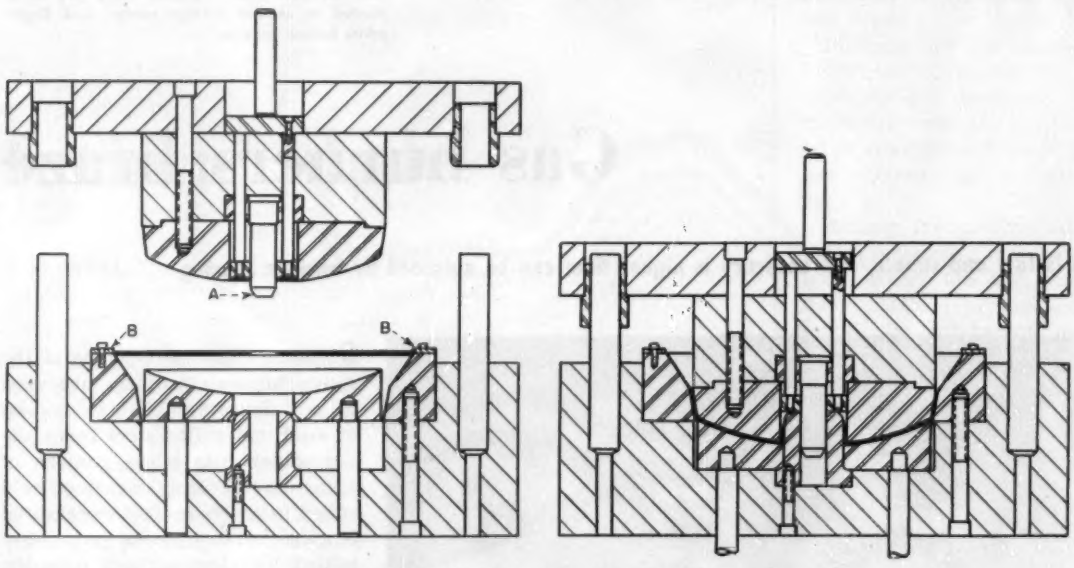


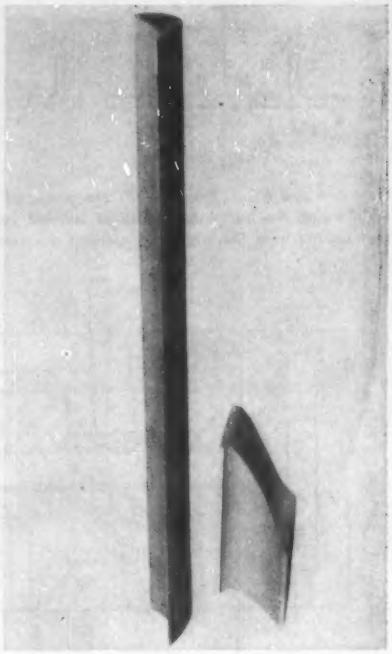
Fig. 8 . . . Outer flange must be drawn almost completely before burring starts. To avoid loading difficulties, as with a long pilot in lower member, the pilot is placed in the punch assembly

B. If the pilot were located in the lower half of a die, as shown in Fig 7, it would have to be of considerable height and it would be necessary for the hole in the blank to slide down the sides of the pilot for its entire length. This might damage the hole in the blank.

A further advantage of placing the pilot in the upper half of the die is the ease and speed with which the blank can be placed in the die. It is often difficult to place a large blank over a small pilot. If approximate gages are provided, and the pilot is allowed to descend from the top to bring the blank into its final position, more stampings can be produced per hour with less effort.

Part XXII of Mr Cope's series will appear in an early number.

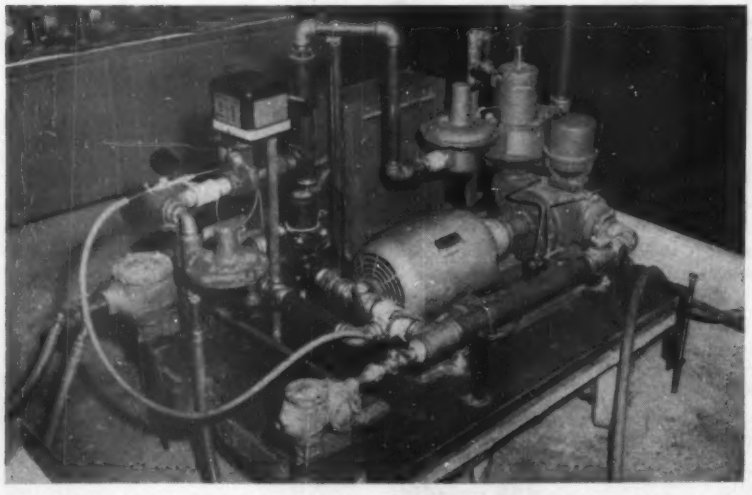
ONLY THREE CLAMPING FIXTURES are needed to produce one assembly every 4 min when brazing bases to blades for large steam turbines. At brazing position (foreground) two compacted-type gas burners heat joint to 1200 F



COLD-ROLLED BLADE and machined base are silver-brazed to form large stationary blade for central-station steam turbine. Parts are sand-blasted to remove foreign matter and fingerprints before brazing

Gas burners braze

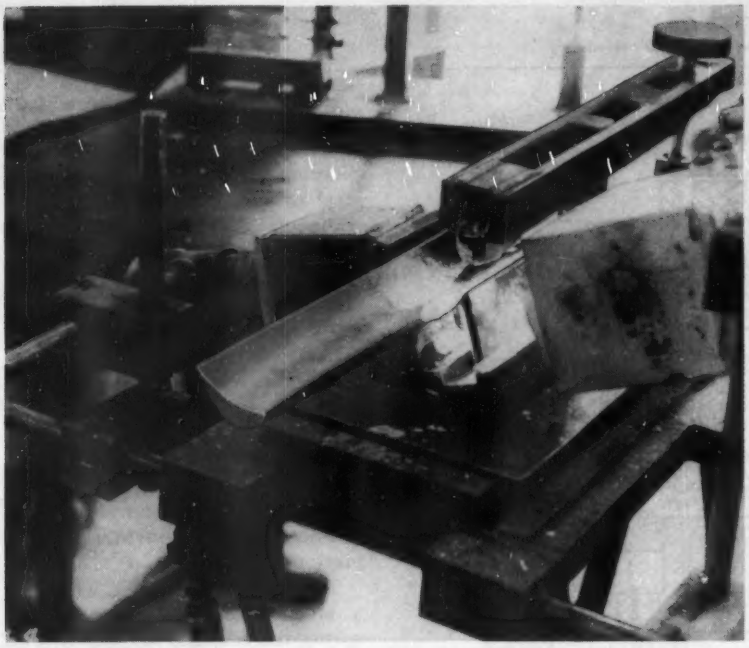
Setup is fast and simple, and accuracy is higher than can be obtained by furnace brazing



MIXTURE OF NATURAL GAS and compressed air for Selas burners at brazing station is provided by truck-mounted assembly of motor-driven compressor, gas pressure regulator, mixing valves, and solenoid valves. Bench and truck can be moved about shop as needed

Stationary blades for some of the steam turbines recently produced at our Sunnyvale Works consist of mild, hot-rolled steel bases silver soldered to blade sections of 12% chrome stainless steel cold rolled to shape and cut to required lengths. Base blocks are form milled for close contact with the blade shape. Blade lengths are heat-treated to 15 to 24 R_C by heating to 1750 F, then drawing at 1200 F. Blades and base blocks are sand blasted immediately prior to brazing, so they will be free of grease and finger marks.

At the brazing bench, joint surfaces are coated liberally with "Handy Flux" paste, then a sheet of 0.006-in. thick "Easy-Flo" silver solder is placed in the joint



HOT FLAMES produced by Selas compacted-type burners are adjustably positioned at brazing station to direct heat toward base block. They must be reset for each size of blade

turbine blades

E M MIEKLEY, supervisor of tool design,
SUNNYVALE WORKS, WESTINGHOUSE ELECTRIC CORP

when the two parts are assembled and clamped in a welded-steel fixture. The sheet solder has a melting point of approx 1145 F.

Three clamping fixtures are used by the two operators. One fixture is loaded while the second is supporting an assembly in the brazing position, and the third is holding a previously heated assembly while the solder cools and sets. The fixtures slide easily on the steel table top.

Brazing position is an extension on one side of the table. Here, guide rails and an end stop locate the fixture between two heavy-duty, water-cooled Selas compacted-type burners positioned to direct heat against opposite sides of the base block. Care must be taken that the flames do not impinge on the heat-treated blade. Burning a mixture of natural gas and air, the two Selas heaters bring the base end of the large blade assembly to 1200 F in only 3 min. Total cycle time is approx 4 min per blade, including loading and unloading. Smaller blades require less time.

This procedure is more efficient than the more conventional furnace brazing. Time cycle is considerably shorter and tool cost is much lower, because fewer fixtures are required. In addition, when clamping fixtures are used in a brazing furnace, they lose their holding power as they are heated to brazing temperature along with the parts they support.

Government-owned patents available to industry

A publication containing 657 abstracts of government-owned patents, most of which are available on a royalty-free basis, has been published by the government. It is *Metal Processes and Apparatus, Machinery and Transportation Equipment*, available at $2 per copy from Office of Technical Services, US Department of Commerce, Washington, DC.

The book, prepared by the Commerce Department and the Small Business Administration is intended to make the results of government-financed research available in practical, convenient form.

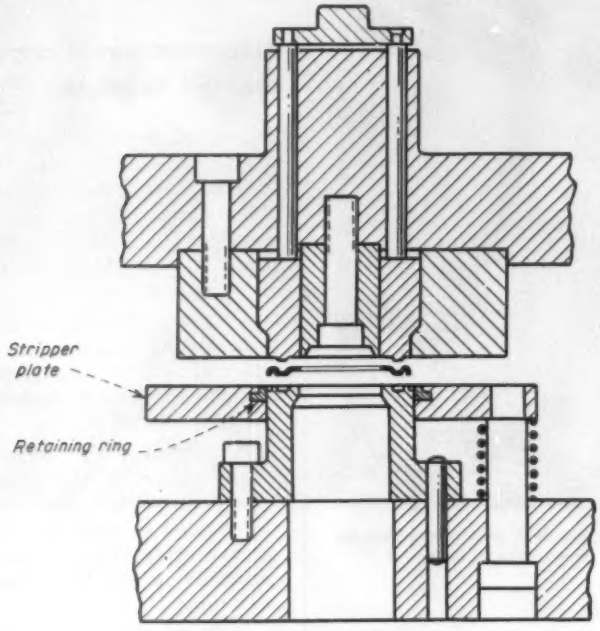
Included are 175 abstracts of inventions applicable to metal products and processes, 311 to machinery, and 182 to transportation equipment. The inventions are classified as to industrial use.

Among the patents included that are meeting with commercial success are the magnetic fluid clutch, a process for diamond die production, a new way of plating nickel and cobalt, a method of protecting boilers against embrittlement.

The book includes the title and number of the patent, name of the inventor, the government agency holding the patent, and a list of the addresses of field offices of the Department of Commerce and the Small Business Administration that may be consulted concerning the availability and use of these inventions.

Other books scheduled for release this year are one on *Electrical and Electronic Apparatus* that will contain 1915 patent abstracts and one on *Ordnance* that will contain 647 patent abstracts.

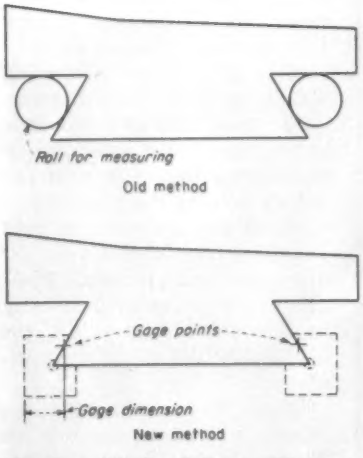
Practical Ideas . . .



Split Spring-Steel Retaining Ring Gives Close Die Stripping

When blanking, forming, and piercing 0.012-in.-thick stainless steel shields, we used an inverted compound die, to meet concentricity requirements. The blanks were pinched off, to obtain an outer lip of only 0.020 in., and springback of the outer lip was depended on to give the stripper plate a little surface to catch the shield on the blanking punch. Springback turned out to be too small, when wear caused excessive clearance between punch and stripper. Ejector pins were not desirable, and we had the problem of excessive stripper replacement.

To avoid this trouble, we made a small split retaining ring of spring temper, and set this ring in a groove in the stripper plate. The ring was forced open and held in place while it was ground to the punch OD. The ring was released and assembled with the die. This ring turned out very well, closing around the punch, without scoring, and providing good stripping qualities on the press. *N Schwartz, Jackson Heights, NY*



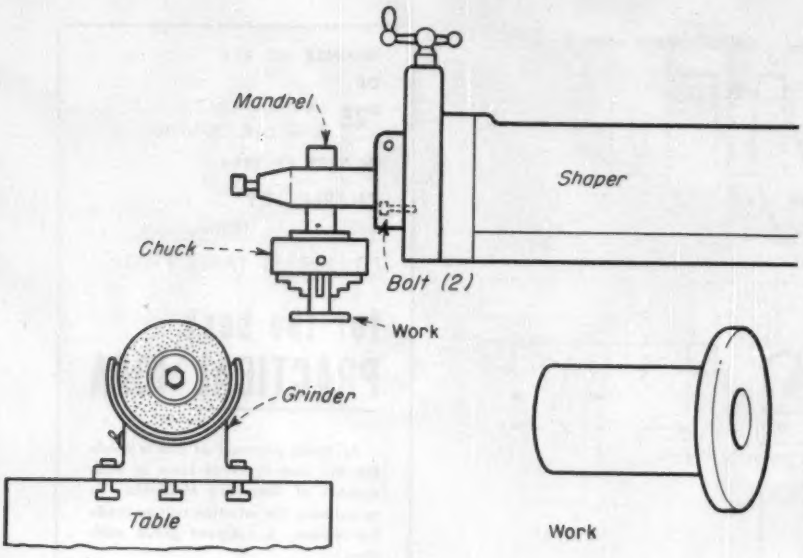
Gaging Method Eases Making Dovetail Form Tools

When grinding the dovetails on form tools, to position the tool form with respect to the holder, we used to grind the dovetail as shown, holding the dimension from the top of the roll to the base of the holder. On simple tools, this could easily be the most troublesome part of the job, because it required bucking the side of a wheel against a wide should, to reach the required tolerance.

The new method eliminates this trouble. Instead of dimensioning to the base, as before, we dimension from a gage point (which we keep constant) to the outside of the gage block, and mill clearance between the base of the holder and tool. We use a constant (usually about 0.0250 in.) distance, so the designer simply specifies the location of the dovetail with respect to the form and holder size.

Because the roll method required grinding a close tolerance which had no purpose in the holding or function of the tool, this grinding operation was eliminated with the gage block method, which also saves some designing time, because it is no longer needed to calculate roll dimensions or refer to a table of standard sizes. *E Quinn, Merchantville, NJ*

To avoid frequent replacement of the guides on our 30-in. bandsaw, we brazed carbide inserts on the guides, and ground them to correct alignment. Instead of replacing them every 60 days, as we did with conventional guides, the carbide tips have been in use for more than 6 months without appreciable wear. *J J Fitzgerald, Ithaca, NY*



Shaper Doubles As Surface Grinder

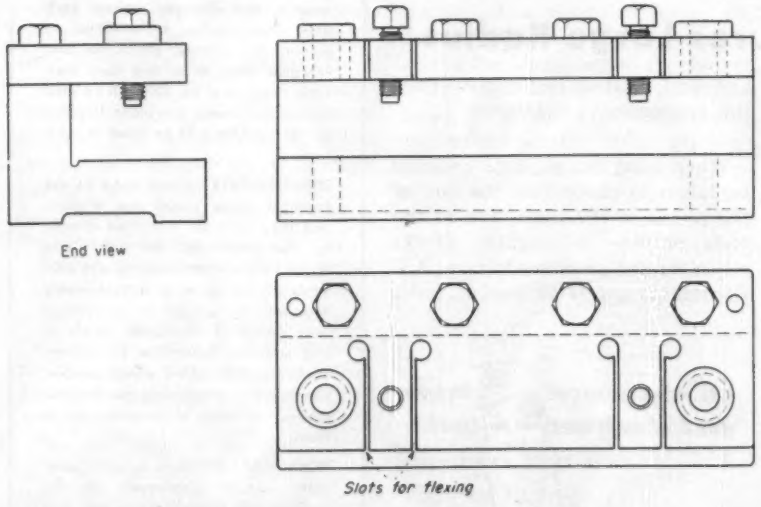
We had to grind the end surface of the work shown here, and didn't have either a suitable surface grinder or lathe available, so we had to improvise on the shaper. The results were very good, with satisfactory accuracy and finish.

To make the setup, we made a mandrel of quite thick material, and adapted it to the shaper toolholder on one end, and to a small universal chuck on the other end. Then the mandrel was mounted in place, with the chuck attached in the position shown.

The work was held in the chuck, and the toolpost of the shaper was given added rigidity by bolting it to the head of the shaper, eliminating swinging of the chuck as the head moved.

These bolts prevented the clapper from lifting the work on the return stroke.

A bench grinder was bolted to the table of the shaper, and we were ready to start the job. Vertical feed was obtained with the standard shaper feed, while traverse of the shaper table gave us the transverse movement needed. The work was finished quickly and easily. *Gurbachan Singh, chargeman, Central Tractor Organization, Bairagarh, Bhopal, India*

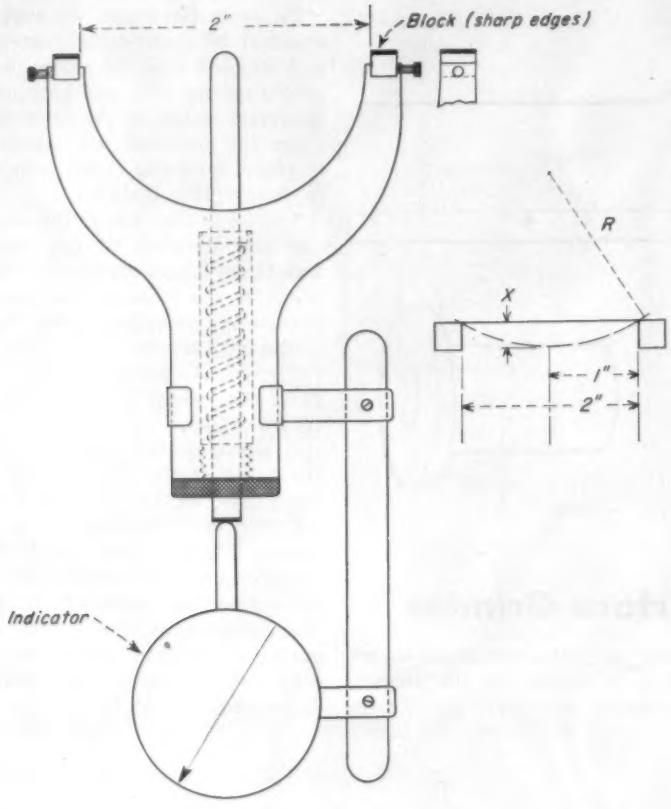


Slots Indicate Fixture Distortion

The figure shown here was giving considerable trouble because when the setscrews were tightened excessively, the fixture bent slightly, causing misalignment of the drills in their bushings, which led to considerable trouble.

To correct this condition, we drilled relief holes, as shown, and sawed slots from the outside edge of the fixture to these holes. When the setscrews were tightened, the "tongues" deflected, indicating to the operator that he had tightened too much, and he could back off until the load was correct.

This method is especially useful when the work is light and would bend under too much pressure from the holding screws. *G R Milner, Gainsborough, England*



Simple Gage Measures Large Radius

This fork-framed gage will conveniently measure large radii without the necessity of reaching across the diameter of the work. The gage consists of a fork frame with two rectangular blocks, one at the end of each of the fork tips. A pin passes through the center of the frame and contacts a dial indicator.

The rectangular blocks are set 1 in. away from the center line, so the distance between the inner edges of the blocks is 2 in.

When the gage is placed against the circumference of the work, the pin is moved a given distance x, which can be used to calculate the radius of the work. Here are the equations.

$$R^2 = (R - x)^2 + 1$$
$$= R^2 + x^2 - 2Rx + 1$$
$$R = \frac{x}{2} + \frac{1}{2x}$$

For larger radii, x is very small, and half of it is negligible. Thus the approximate radius $= \frac{1}{2x}$.

When using this gage, care should be taken to check that the end of the pin is in the same line as the ends of the rectangular blocks when the indicator reads zero. *A C Bhattacharyya, West Bengal, India*

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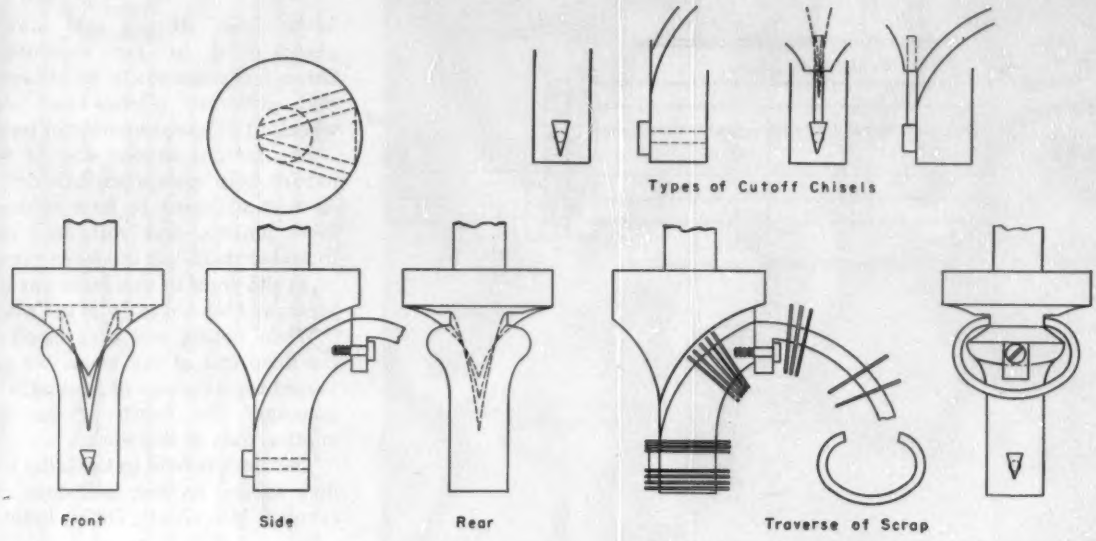


Tapered "Horns" Eliminate Strippers

When metal parts have been stamped or formed, and have a fringe or border on them, the stripping and removal of this fringe can be a nuisance. This is particularly true of progressive dies, such as eyelet machines or dial presses, where one of the operations is stripping the fringe from the punch.

The common method of removing the stripped scrap is with an air jet. This is unsatisfactory because the shape of the trimmings makes them hard to guide successfully, and they sometimes bounce back and foul the tool.

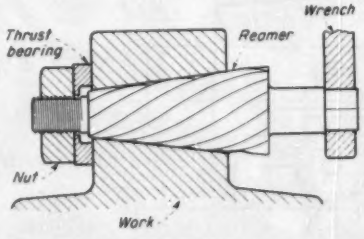
The method shown here removes such trimmings and puts them into a container, eliminating the need for ejection. The pieces accumulate on the punch, and each press stroke pushes the pile of scrap higher onto the punch.

On the front of the punch is a narrow V-shaped cutter with a sharp edge which splits the scrap as it travels upward. Also on the punch is a circular groove which starts on the straight side of the punch and curves upward and to the back or side of the press.

The lower ends of these grooves meet on the punch, terminating in a "V" on the punch. As the grooves are widened at the top of the punch, the scrap is forced apart, causing the split ends of the trimmings to grip the punch.

A flat bar is fastened to the punch, extending outward and downward at the rear of the punch where the scrap leaves the groove. This bar carries the trimmings away from the press into a container at the rear of the machine. The bar must be wide enough to keep the trimmings from turning, to keep the split edges on top.

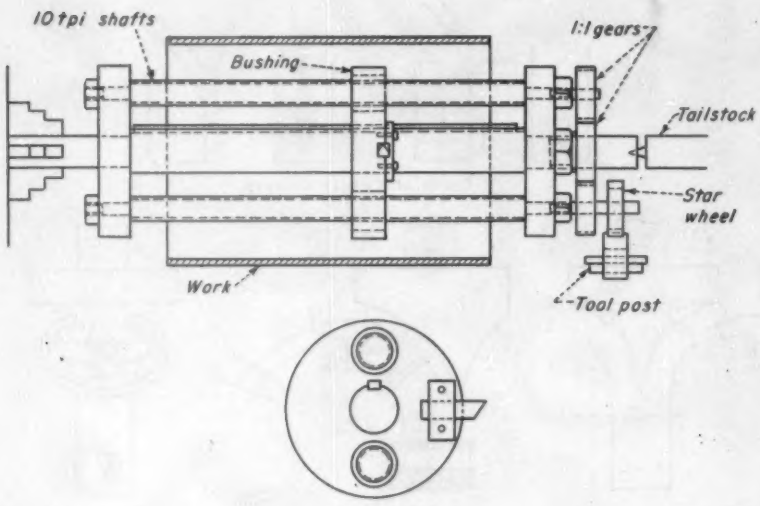
Two kinds of chisels are shown. The first is attached to a stud which passes through the plunger, and is a press fit in the hole. The other is attached to a shank which fits into a shoulder on the punch. This shoulder projects from the plunger just above the start of the grooves. *F E Chace, Pawtucket, RI*



Threaded Stud Aids Tapered Reamer

We often have to recut tapered holes (1¾-in. diameter at the large end) in truck rear axle housings. The holes wear out frequently, and refitting the whole assembly would be too expensive.

The taper in the part is quite steep, and it is sometimes hard to get a "grip" on the metal with the tapered reamer. To avoid this trouble, we made the reamer shown here. At the small end of the reamer we left a stud which was threaded with a fine-pitch thread. When using the tool, a thrust bearing is placed on the end of the work, and a nut lightly screwed onto the threaded stud. The reamer is turned by hand with a ratchet wrench, and, as the reamer cuts itself free, the nut is tightened just enough for proper cutting pressure. With this arrangement, we can get just the right pressure on the reamer without difficulty. *Max Karfunkel, Haifa, Israel*



Setup Bores Large Work On Lathe With Short Bed

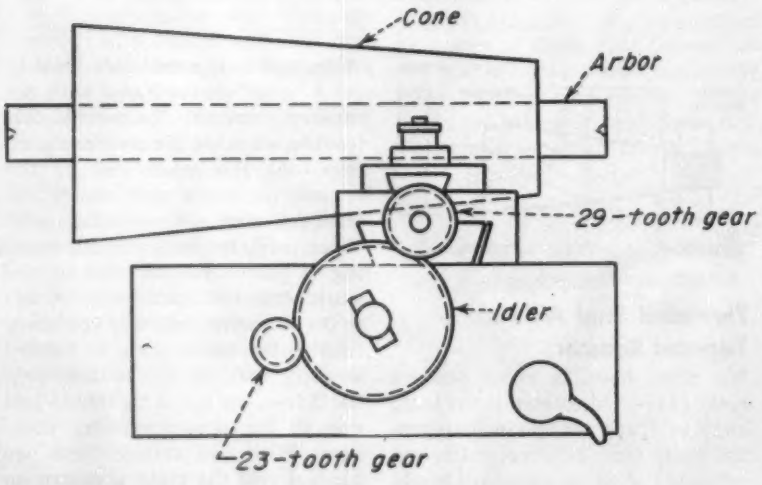
The setup shown here was used to bore large cylinders (6 ft long) on a medium-sized (9-ft bed) lathe which did not have enough room for special equipment for such large work.

The boring fixture consists of a central shaft and three round cast iron auxiliary shafts. The central shaft holds the cutting tool, and drive is given the tool through two threaded shafts and a star wheel. As the fixture moves with the chuck, the 25-tooth star wheel strikes a block held in the toolpost of the lathe, and the boring tool moves ahead 1/25th of the pitch of the thread. In our case, this was a 10-tpi lead, so the tool moved ahead 0.004 in. per revolution. Other feeds can easily be obtained with different pitches and star wheels of different number of teeth.

The pinions at one end of the fixture help give a smooth drive. At first we tried to bore without these pinions, and with only one threaded shaft, but the force exerted at the point of tool feed was too great, and tended to twist the shaft.

When boring had progressed to the deep end of the work, we reversed the direction of feeding, and increased the depth of cut for another pass at the work.

The work is held in the lathe bed in a special fixture, and does not revolve. *M L Gupta, Delhi, India*

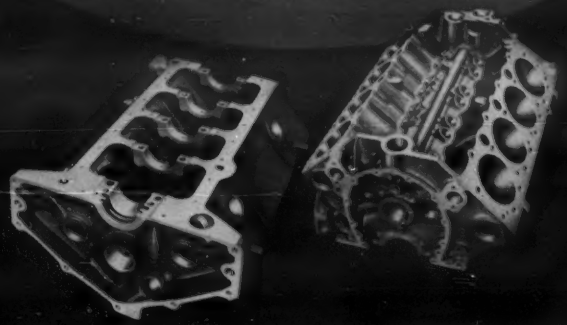


Pinion-Drive Turns Cone Taper

This arrangement of gears attached to the leadscrew of our lathe help us to turn a taper on a long cone which is supported on centers. By calculation, we found that the required gear ratios on the lathe were a 23-tooth gear on the handwheel shaft, an idler gear of adequate size to span the two working gears, and a 29-tooth gear on the crossfeed shaft. As the tool is fed toward the headstock of the lathe, the drive takes the tool away from the work at the predetermined rate of feed. In our case, the rate of tool feed was 15/16-in. per foot giving us a taper of 1⅞ in. per foot. Depth of cut is changed by the compound rest on which the tool is mounted. *Manohar Lal, Delhi Cloth Mills, Delhi, India*

350 Foot Automation Line Performs 555 Operations on V-8 Cylinder Blocks

Another Transfer-matic by Cross



- ★ 100 pieces at 100% efficiency.
- ★ Operations: 265 drilling, 6 milling, 21 boring, 56 reaming, 101 countersinking, 106 tapping, and 133 inspection.
- ★ 104 stations: 1 for loading, 53 for machining, 7 for part handling, 6 for mechanical inspection, 36 for visual inspection, 1 for unloading.
- ★ 5 independent machine sections with provision for banking parts between each section; master automatic cycle for operating all 5 sections simultaneously.
- ★ Capacity for removing work piece at every station.
- ★ Automatic independent transfer mechanism for each machine section and automation units for handling parts from machine section to machine section.
- ★ Automatic air pressure test for high pressure oil holes and automatic depth inspection for all holes before tapping.
- ★ Pre-set tooling throughout.
- ★ Other features: Coolant system for tapping section, complete interchangeability of all standard and special parts for easy maintenance, construction to J.I.C. standards, hardened and ground ways, hydraulic feed and rapid traverse, automatic lubrication, automatic chip disposal.

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Gear-Hob Tolerances...III

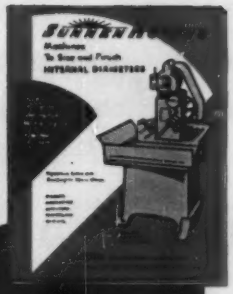
HERBERT V GREGG, Chief Engineer, STAR CUTTER CO, FARMINGTON, MICH

TOLERANCES FOR MULTIPLE-THREAD GEAR HOBS...I

(In Ten-Thousandths of an Inch)

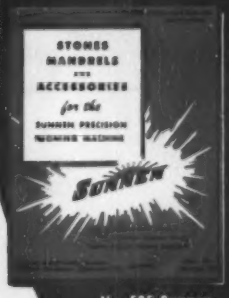
DIAMETRAL PITCH ▶				2 THRU 2.999	3 THRU 3.999	4 THRU 4.999	5 THRU 5.999	6 THRU 8.999	9 THRU 12.999	13 THRU 19.999	20 THRU 29.999	30 THRU 50.999	51 AND FINER
RUNOUT*	HUB FACE		A	5	2	2	2	2	2	2	2	2	2
			B	8	4	4	3	3	2	2	2	2	–
			C	8	4	4	3	3	2	2	2	2	2
			D	8	5	5	4	4	3	3	–	–	–
	HUB DIAMETER		A	5	4	3	3	3	2	2	2	2	2
			B	8	6	5	4	4	3	2	2	2	–
			C	8	6	5	4	4	3	2	2	2	2
			D	10	8	8	6	6	5	5	–	–	–
	OUTSIDE DIAMETER		A	20	15	15	10	10	10	10	10	7	5
			B	30	25	20	15	15	15	10	10	7	–
			C	45	40	30	25	20	20	15	15	10	8
			D	55	50	45	35	35	30	25	–	–	–
LEAD* VARIATION	IN ONE AXIAL PITCH		A	18	10	8	6	5	5	4	4	3	3
			B	25	17	11	9	7	7	6	6	4	–
			C	35	22	14	11	9	9	8	8	8	6
			D	50	40	30	25	20	20	18	–	–	–
	IN THREE AXIAL PITCHES		A	30	15	12	9	8	8	7	7	5	5
			B	38	22	20	15	12	12	10	10	7	–
			C	50	30	28	20	18	16	14	14	12	8
			D	100	80	60	50	40	35	25	–	–	–
	TOOTH TO TOOTH	2 THREAD	A	6	5	4	3	3	3	3	2	2	2
			B	10	7	6	5	5	5	4	3	2	–
			C	14	10	9	7	6	6	5	5	3	3
			D	22	18	16	14	12	11	9	–	–	–
		3 THREAD	A	7	6	4	4	4	3	3	3	2	2
			B	12	8	7	6	6	5	5	4	3	–
			C	16	12	10	8	7	6	5	5	4	3
			D	24	20	18	16	14	12	10	–	–	–
		4 THREAD	A	7	6	5	4	4	4	3	3	3	2
			B	13	9	8	7	6	6	5	4	4	–
			C	18	13	11	9	7	7	6	5	4	4
			D	26	22	20	18	16	13	11	–	–	–
		5 THREAD	A	8	7	5	4	4	4	4	3	3	3
			B	14	10	9	8	7	6	6	5	4	–
			C	20	14	12	10	8	8	7	6	5	4
			D	28	24	22	20	17	14	12	–	–	–
		6 THREAD	A	9	7	6	5	4	4	4	4	3	3
			B	15	11	9	8	7	7	7	6	5	–
			C	22	15	13	11	9	9	8	6	6	5
			D	30	26	24	21	18	15	13	–	–	–
Adjacent Thread to Thread SPACING in Plane of Rotation	2 THREAD		A	9	8	7	6	5	4	3	3	3	3
			B	12	11	10	9	8	6	5	5	5	–
			C	17	15	13	11	10	9	8	7	6	5
			D	22	19	17	15	13	12	11	–	–	–
	3 THREAD		A	11	10	8	7	6	5	4	4	4	3
			B	14	12	11	10	9	7	6	6	6	–
			C	19	16	14	13	11	10	9	8	7	6
			D	24	20	18	16	15	13	12	–	–	–
	4 THREAD		A	13	12	9	8	7	6	5	4	4	3
			B	16	14	12	11	10	8	7	7	6	–
			C	21	18	15	14	12	11	10	9	8	7
			D	26	22	20	18	16	14	13	–	–	–
	5 THREAD		A	15	14	10	9	8	7	6	5	4	3
			B	18	16	13	12	11	9	8	7	6	–
			C	23	20	17	16	13	12	11	10	8	7
			D	28	24	22	20	17	15	14	–	–	–
	6 THREAD		A	17	16	12	10	9	8	7	6	5	4
			B	20	18	15	13	11	10	9	8	7	–
			C	25	22	19	18	14	13	12	10	9	8
			D	30	26	24	22	18	16	15	–	–	–

NOTE: *Total Indicator Reading



No. 50 Sunnen Honing Machines

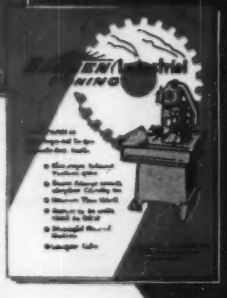
No. 51 Sunnen Portable Cylinder Hones



No. 505 Sunnen Honing Supplies & Accessories

No. 55 Sunnen Tool Room Honing

No. 58 Sunnen External Hones



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Gear-Hob Tolerances . . . IV

TOLERANCES FOR MULTIPLE-THREAD GEAR HOBS . . . II

(In Ten-Thousandths of an Inch)

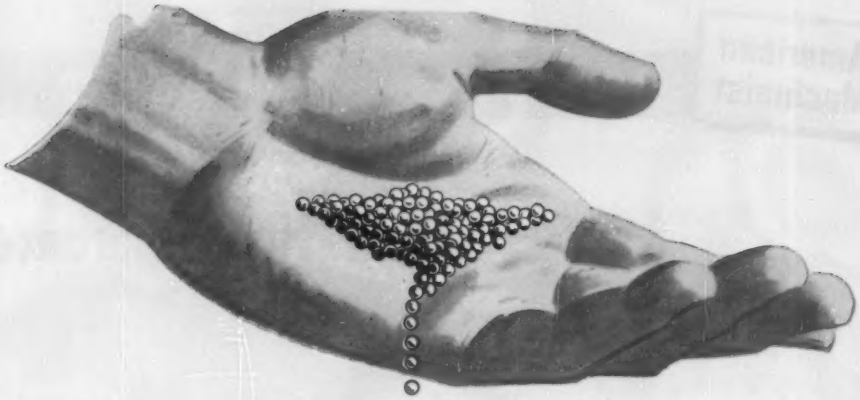
DIAMETRAL PITCH ▶				2 THRU 2.999	3 THRU 3.999	4 THRU 4.999	5 THRU 5.999	6 THRU 8.999	9 THRU 12.999	13 THRU 19.999	20 THRU 29.999	30 THRU 50.999	51 AND FINER
TOOTH ELEMENTS		TOOTH THICKNESS (MINUS ONLY)	A	20	15	15	10	10	10	10	10	5	5
			B	20	15	15	10	10	10	10	10	5	–
			C	25	20	20	15	15	15	15	15	10	10
			D	35	30	25	20	20	20	20	–	–	–
		START OF APPROACH (PLUS OR MINUS)	A	180	160	140	120	100	80	60	50	40	–
			B	200	180	160	140	120	100	80	60	50	–
			C	200	180	160	140	120	100	80	60	50	–
			D	240	220	200	180	160	140	120	–	–	–
		SYMMETRY IN START OF APPROACH	A	130	120	100	90	80	60	50	40	30	–
			B	150	130	120	100	90	80	70	60	50	–
			C	150	130	120	100	90	80	70	60	50	–
			D	180	160	140	120	110	100	90	–	–	–
	PRESSURE ANGLE OR PROFILE*†	2 THREAD	A	7	5	4	3	3	2	2	2	2	2
			B	10	7	5	5	4	3	3	3	2	–
			C	16	11	7	5	4	3	3	3	3	3
			D	55	30	18	12	8	8	7	–	–	–
		3 THREAD	A	8	5	4	3	3	3	2	2	2	2
			B	10	7	5	5	4	4	3	3	2	–
			C	16	11	7	5	4	4	3	3	3	3
			D	55	30	18	12	8	8	7	–	–	–
		4 THREAD	A	8	5	4	3	3	3	2	2	2	2
			B	10	7	5	5	4	4	3	3	2	–
			C	16	11	7	5	4	4	3	3	3	3
			D	55	30	18	12	8	8	7	–	–	–
		5 THREAD	A	8	5	5	4	4	3	2	2	2	2
			B	10	7	6	6	5	4	3	3	3	–
			C	16	11	8	6	5	4	3	3	3	3
			D	55	30	18	12	9	8	7	–	–	–
		6 THREAD	A	8	5	5	4	4	3	2	2	2	2
			B	10	7	6	6	5	4	3	3	3	–
			C	16	11	8	6	5	4	3	3	3	3
			D	55	30	18	12	9	8	7	–	–	–
SHARPENING*		SPACING BETWEEN ADJACENT FLUTES	A	30	25	20	15	10	10	10	10	10	10
			B	45	40	30	20	15	15	10	10	10	–
			C	45	40	30	20	15	15	10	10	10	10
			D	60	50	50	30	25	25	20	–	–	–
		SPACING BETWEEN NON-ADJACENT FLUTES	A	60	50	40	30	30	30	25	25	20	20
			B	90	80	60	50	50	50	40	35	30	–
			C	90	80	60	50	50	50	40	35	30	30
			D	120	100	100	80	80	70	60	–	–	–
		CUTTING FACES RADIAL TO CUTTING DEPTH	A	15	10	8	6	5	5	3	3	3	3
			B	25	15	10	8	7	7	5	5	5	–
			C	25	15	10	8	7	7	5	5	5	5
			D	75	50	40	30	20	20	15	–	–	–

			UP TO 8 IN.	1.001 TO 2 IN.	2.001 to 4 IN.	4.001 TO 7 IN.	7.001 IN. AND UP
FACE WIDTH	ACCURACY OF FLUTES (STRAIGHT AND HELICAL)	A	10	15	25	30	50
		B	10	15	25	30	50
		C	10	15	25	30	50
		D	15	23	38	45	75

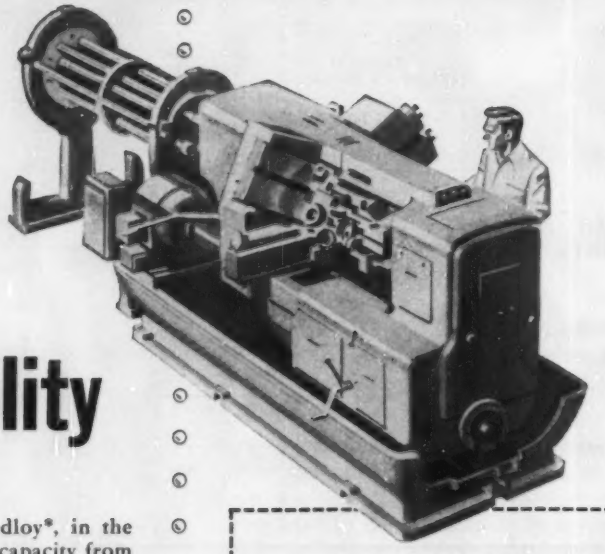
			2.500 IN.	2.000 IN.	1.500 IN.	1.250 IN.	.750 IN.	.500 IN. AND SMALLER
HOLE DIAMETER	(PLUS ONLY)	A	8	8	5	2	2	2
		B	10	10	8	3	2	2
		C	10	10	8	3	2	2
		D	10	10	8	5	4	3

NOTE: *Total Indicator Reading.

†Exclusive of Modification for Tip Relief (Approach).



Aristoloy steels with lead added for improved machinability



● There's "seasoning" added to Ledloy*, in the form of lead that gives you ⅓ more capacity from your screw machines. This free machining steel has a built-in bonus because Ledloy steel feeds faster, finishes better, and greatly reduces tool wear. This is how it's accomplished: Evenly distributed, submicroscopic particles of lead serve to reduce friction between tool and chip. Forgability, carburization and heat treatment are not affected, and no health hazards are involved in normal machining, handling, heat treating, or forging.

Our Field Metallurgist will be happy to discuss Ledloy with you and how it can be applied to your product. Similar advantages can also be obtained through use of leaded alloy steels which are available in full range of A.I.S.I. or S.A.E. standard analyses. Call or write today for complete information.

*Inland Ledloy License

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Speeds and Feeds for Turning Steel

COURTESY MONARCH MACHINE TOOL COMPANY

SPEED AND FEED CHARTS

Depth of Cut	Feed	** Surface Speed					
		Class (1) (Average 160 BHN)		Class (2) (Average 207 BHN)		Class (3) (Average 260 BHN)	
		HSS*	CARBIDE	HSS	CARBIDE	HSS	CARBIDE
1/32"	.008"	400	1000	240	850	120	500
	.015"	300	950	180	700	90	400
1/16"	.008"	325	900	200	800	100	450
	.015"	250	700	150	600	75	350
1/8"	.008"	260	750	160	550	90	350
	.015"	200	600	120	450	60	300
	.031"	140	450	85	350	45	250
3/16"	.008"	230	700	140	520	75	300
	.015"	180	550	110	450	55	250
	.031"	130	350	80	300	40	225
1/4"	.008"	210	600	125	500	65	300
	.015"	160	550	100	450	50	225
	.031"	115	350	70	300	35	200
3/8"	.015"	145	450	90	350	45	250
	.031"	100	300	60	275	30	200
	.062"	70	250	45	200	23	175
1/2"	.015"	130	300	80	300	40	200
	.031"	90	250	55	250	28	150
	.062"	65	200	40	150	20	60
	.093"	50	—	30	—	16	—
	.125"	40	—	25	—	13	—
3/4"	.031"	80	250	50	200	25	150
	.062"	55	175	35	150	18	—
	.093"	45	—	25	—	13	—
	.125"	35	—	22	—	11	—

* Reduce speeds for rough steel forgings and cast steels. For best tool-life use heavier feed and lower surface speed.

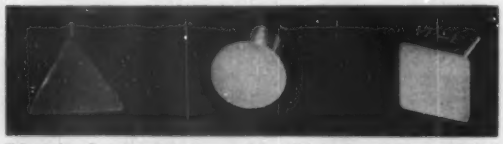
** Speeds based on 2 hour tool-life.

(Advertisement)

A NEW CONCEPT IN MACHINING WITH CARBIDE

New Vascoloy-Ramet Toolholder with "Built-In" Carbide Chipbreaker in operation. V-R Toolholders are made for Full Length, "Half-Length" and "Throw-Away" Length Inserts.

Machining with carbide has been synonymous with progress. Now, another milestone in the progress of carbide machining has been reached with the development of the New V-R Toolholder and New "Throw-Away" Blanks. One of the most serious problems in carbide machining has been the problem of carbide grinding, both chipbreaker grinding and re-grinding of the carbide after it has been in service. As an answer to these carbide grinding problems the Vascoloy-Ramet Corporation has developed a new Toolholder System which completely eliminates all carbide grinding. The New V-R Toolholder System consists of Toolholders for Triangular, Round and Square blanks and New "Throw-Away" blanks . . . blanks which are so economical they can be used in the Toolholder for machining operations and then thrown away.



Triangular, Round and Square precision "Throw-Away" Blanks for V-R Toolholders. Precision "Throw-Away" Blanks are ground all over and are used where precision indexing is desired. Utility "Throw-Away" Blanks, ground on two faces only, are also available in Triangular and Square Blanks.

The combination of New V-R Toolholders with their "Built-In" carbide chipbreaker and New "Throw-Away" blanks offers tremendous savings.

Compare the cost per cutting edge of a brazed tool based on: 1. Original cost of the Tool. 2. Cost of Each Re-grind. 3. Number of Regrinds obtainable . . . Against the cost per cutting edge of V-R "Throw-Away" Blanks.

$$\frac{\text{Brazed Tool Cost} + (\text{Number of regrinds} \times \text{cost per grind})}{\text{Number of regrinds} + 1 \text{ (for original tool)}} = \text{Cost per cutting edge}$$

Example:

$$\frac{\$2.40 + (6 \times .45)}{6 + 1} = \frac{510}{7} = \$.73 \text{ Cost Per Cutting Edge for a Brazed Tool.}$$

Compare this $.73 cost per cutting edge for a brazed tool with the 10¢ cost per cutting edge for a V-R ⅜" I.C. "Throw-Away" Blank and you have a savings of 63¢ per cutting edge. Multiply this 63¢ savings by the number of cutting edges and you have the savings resulting from using "Throw-Away" blanks in the V-R Toolholder.

Following is a case history which illustrates a new concept in machining with the New V-R Toolholder System. Material machined: 12" diameter, ⅜" wall, SAE 1020, 4' length of cut welded steel tubing. This 12" diameter tubing is being run at 762 RPM or about 2,392 Surface Feet Per Minute. The depth of cut is .100" and the feed is .021". Machining time is 4 minutes. New Utility "Throw-Away" Blanks in the New V-R Toolholder are now being used to do this machining.

New V-R Toolholder with "Built-In" chipbreaker plate. For use with "Throw-Away" Precision or Utility "Throw-Away" Blanks.

Figuring machining time at approximately 10¢ per minute in that area and using a machining time of 5 minutes it costs 50¢ to machine one piece using the V-R Toolholder System.

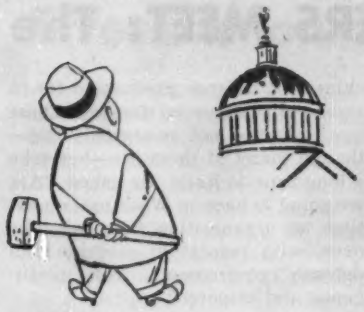
Style BR Brazed Tool formerly used in this machining operation.

Previous machining time with carbide brazed tools was 30 minutes giving maximum tool life. (This can be considered normal for single point tools). Using the cost for machining time at 10¢ per minute it costs about $3.00 in machining time alone using brazed tools as compared to a cost of 50¢ using the New V-R Toolholder system. Naturally at speeds of 2,300 feet per minute you cannot expect tool life, but when a "Throw-Away" ⅜" I.C. Triangular Blank can be purchased for 58¢ or roughly 10¢ per cutting edge, why shouldn't 10¢ be spent to earn $2.50 additional?

Even greater savings than those calculated result, because there is no carbide grinding with the V-R Toolholder system. Formerly if one brazed tool would give 20 pieces per grind while another would give 25 pieces, naturally, the latter tool was preferred. Up to the present time tool life has always been the goal. Now, however the "Tool" becomes expendable and "Time" becomes important. Further information on this new concept in machining including cost comparison cards to be used in calculating specific brazed tool—"Throw-Away" Blank costs and information on the new V-R Toolholder System may be obtained by writing the

VASCOLOY-RAMET CORPORATION
818 Market Street, Waukegan, Illinois.

Talking Shop . . .



Point of View

READING the revised edition of *The Story of Scrap* by Edwin C Barringer, we were struck by the differences in viewpont. For example, we are used to thinking of chips produced in a metalworking operation as waste. To a scrap man, they are "yield." The average yield is 13%.

By industry, the "production" of scrap averages: cans and closures 8%, tractors 10%, metalworking equipment 17.5%, agricultural machinery 18%, electrical machinery 21%, forgings 30%, shipbuilding 5%, ordnance 30%, aircraft 10%, and hand tools 15%.

But the scrap potential doesn't end with delivery of the finished product, as obsolescense, corrosion, and failure move in. "Even the dome of the Capitol in Washington," says Mr Barringer, and you can almost see his mouth water, "which is cast iron, at some future date will be scrap."

Despite this difference in viewpoint, we found the book interestng and learned quite a bit about the mechanics of scrap collection and the organization of the industry. The book is published by the Institute of Scrap Iron & Steel, Inc.

Listen

"NO MAN IN AUTHORITY can ever do too much listening" suggests The Royal Bank of Canada. It makes a strong case for the executive who elicits as much information as possible, meanwhile observing, examining, appraising. This not only gives him a better basis for decision and more knowledge of sub-surface problems, but also establishes a friendly basis upon which the executive can build acceptance for his own ideas, policies and program. Business is not impersonal, it only looks that way. Underneath, it is a chain of intensely personal things.

Steamboat 'Round The Bend

IT'S THE LITTLE THINGS that make life interesting. That's as true in metalworking plants as it is anywhere else. For example, in the Max Ams Machine Co plant in Bridgeport, the sound of the crane whistle comes as quite a surprise to the casual visitor the first time he hears it. When the production man wants the crane, he walks over and gives the cord a yank, and out comes the sound of a steamboat whistle. (Actually, the whistle was taken from an old yacht, but it sounds just like life on the Mississippi.) The crane operator, said to be the first woman crane operator in Connecticut when she got the job some years ago, comes out of the blueprint room, where she doubles in brass, and climbs into the crane, and away she goes.

Hurry Unhurriedly

GIVING THE APPEARANCE of being in a hurry does *not* excite the sympathy and invite the assistance of people around you. It suggests, instead, that you can't do your job without hurrying. And, more importantly, it makes your compatriots hold back because they don't want to be rushed into a decision or an action. You can be in a hurry — but the trick is to look unhurried if you want cooperation.

Why Discipline?

DISCIPLINE is too frequently punishment for an offense. What is gained by punishment for the spoiled job, the wrong decision? The true purpose of discipline is to prevent repetition of the offense, thus it should be constructive. If an honest mistake results in a violent "going-over", the person who made the mistake is likely to come out of it feeling irritated by discipline and regulation in general. That means more trouble in the future. For example, we on *AM* have made many mistakes. Some of the major ones have brought understanding letters and built in us a determination to repay the letter-writer for his tolerance. Some of the minor ones bring violent diatribes that suggest to us the author is insecure in his job and is trying to make an impression. He does — but it is the wrong one.

Almost

"HENRY FORD almost had the automatic transmission in the original Model T," recalled an old-time gear engineer from Detroit recently. "He was about 60% there with the planetary setup he used, but who ever thought of an automatic transmission then?" Come to think of it, who ever thought of automatic steering and braking—and automatic machine tools to make parts for them? We were "almost" there on all of them years ago, but people weren't yet ready for the idea—that's why they weren't thought of.

Clean Display

TOURING the new research laboratories of Oakite Products we were struck by two things: 1, the number of different compounds and compositions necessary for different cleaning operations, and 2, the research lab includes an exhibit-building department. The varous Oakite compounds spread into so many fields that it is a quiet week when they aren't exhibiting at a show or two. And under the circumstances a fresh, clean-looking exhibit might be considered a must. A paint-spray booth and other cleaning and finishing equipment are included in the department, making it possible to do a little field testing near at hand. Probably explains why we found it located in the research laboratory.

Buyer's Market

LOCAL AUTOMOBILE DEALER has this over-size sign in his window: "Orders now being accepted for '55 models," This suggests an attitude he should not have, considering present conditions and other signs in others of his own windows, such as: "Terrific deals in '54 models", "You make the offer", "Highest trade-in," and so on. He, like so many purveyors of other products, keeps dreaming that we'll soon return to the happy days since the war, when anybody could sell anything at his own price. The indications are that the buyer will have a bit more to say about it.

MACHINE TOOL BUILDERS MEET: The

Other topics mulled over at White Sulphur Springs: the 1955 Machine Tool Show, tax writeoffs, Vance Plan spending, US tool leasing, foreign trade, tools for defense, and proposed new standards for some machine tool types

WHITE SULPHUR SPRINGS, W Va — Chief objective of the machine tool industry will continue to be to convince U S metalworking plants of the enormous opportunity to increase their profits by modernizing their production equipment.

The Machine Tool Show at the International Amphitheatre in Chicago in September 1955 will be the best place for machine tool users to see modern, newly-designed machine tools — "the world's best investment" — in action.

Preservation of a strong machine tool industry, with ample capacity to produce machines in a national emergency, is one of the nation's best and least expensive defense measures.

These and many other conclusions were reached at the 53rd annual meeting of the National Machine Tool Builders' Association at the Greenbrier Hotel November 17-20.

The nation's metalworking shops have open to them three modernization incentives to cut costs in a competitive market, Herbert L Tigges, president of the association and executive vice president Baker Brothers Inc, said. They can write new machines off for tax purposes much faster now than formerly. They can take advantage of the more rapid rate of development of new machines. They can attend the Machine Tool Show in Chicago and compare the various makes and types of machines in action.

The key to the replacement situation, Mr Tigges stated, is selling. Machine tool builders must prove to users that replacement means lower costs and larger net profits. If they do that, builders also will be contributing to the continued protection of the country and to a sound domestic economy.

Tools for Defense

Mr Tigges posed the problem of what we will do "if subjected to an attack by a foreign power right here at home." He advocated purchase by the government of critical machines for defense production far in excess of commercial demand. These machines are not necessarily big—though many of them are—but take a long time to build. He asked, "Are we going to have in Washington next time an organization that can take over, with respect to machine tool defense requirements, with intelligence and dispatch?"

Foreign Sales

Best solution to the problem of shrinking foreign sales, Mr Tigges declared, is for the State Department to prevail upon other governments to relax nationalistic policies, eliminate special taxes and restrictive regulations, and permit U S machine tools to compete on an open basis, as they did prior to World War II. Establishment of affiliate companies in foreign countries, he commented, transfers American machine tool know-how and capacity to a part of the world which Russia might be able to overrun quickly.

"A Great Machine Tool Show"

With the best facilities available anywhere in the United States at this time, "we are going to have a place for a great machine tool show," William E Rutz, chairman machine tool show committee and executive vice president Giddings & Lewis Machine Tool Co, said. He was referring to the International Amphitheatre,

NMTBA's New Officers...

PRESIDENT
Milburn A Hollengreen
President & Gen Mgr
Landis Tool Co
Waynesboro, Penna

FIRST VICE PRESIDENT
Louis Polk
President
The Sheffield Corp
Dayton, Ohio

SECOND VICE PRESIDENT & DIRECTOR
Jerome A Raterman
President
Monarch Machine Tool Co
Sidney, Ohio

Stress Is on Plant Modernization

plus the adjoining new Industrial Exposition Hall. Visitors to the show will be able to reserve hotel rooms, early in 1955, through the Chicago Convention Bureau. Next April distribution of registration cards will begin, enabling visitors to present the filled-in card upon arrival. One end will be torn off and inserted in a badge holder to become an identification badge. Accompanying the registration cards being sent out will be an information booklet about the show.

Tool Show Services

A variety of services will be provided at the show, Mr Rutz emphasized. These include: Information booth, travel bureau, housing bureau, batteries of telephones, post office, telegraph office, free interpreter service, restaurant facilities that will seat 3000 at one time, bus service from the Loop hotels to the show and to the Production Engineering Show at the Navy Pier where auxiliary machine tool equipment and parts will be displayed. A shuttle service will operate between the International Amphitheatre and the Navy Pier.

Joseph T Vinbury, chairman of the committee on advertising and advertising manager New Britain Machine Co, made a strong plea for NMTBA members to advertise the coming Machine Tool Show. "We're putting on this show," he stressed, "to show Joe Production that if he has this new machine his work will be easier, he can produce more, he can save time, he can make his employees happier, he can have a more satisfactory break-even point, and he can keep his stockholders happy."

There is a constant and never-ending task to tell every American, and particularly the people in key spots, what machine tools are and what they do to help him live better and to protect him, Alfred V Bodine, chairman of the public relations committee and president The Bodine Corp, declared. This, along with spreading the word about the 1955 show, is the job immediately facing the machine tool industry.

US Machine Tool Leasing

The criteria governing leasing of tools belonging to the government should go beyond the factor of "the best interests of national defense" to include whether "such interests are sufficiently compelling to transcend all other important considerations," Graham E Marx, director Metalworking Equipment Division, Business and Defense Services Administration, asserted. Mr Marx is on leave as vice president and general manager of the G A Gray Co.

He revealed that the armed services plan to increase rental rates on production equipment from 1% a month to 2% on machines made since 1949. This increase will minimize interest that has arisen because of the preferential rates now offered to lessees.

Mr Marx explained the method by which the government disposes of surplus machine tools. BDSA supports the position that modern general-purpose machines in good condition should be kept in the National Industrial Equipment Reserve. The remainder are offered for sale and involve (1) special-purpose tools for making obsolete weapons, (2) machines in very poor condition, and (3) tools available in such large quantities that the number already in the reserve appears adequate. Mr Marx paid tribute to John Williams as the Defense Department's able custodian of the National Industrial Equipment Reserve.

Elephant Tools

BDSA's Metalworking Equipment Division is scrutinizing not only the elephant tool program but also those machine tools, regardless of size, that are in critically short supply in emergency periods. "For it is the shop that can commence balanced production in a minimum of time that best suits defense needs," Mr Marx said. On this basis, "the capacity of machine tool builders and of large general-purpose machine shops continue to be of particular

TREASURER

John C Cotner
President & Gen Mgr
Hydraulic Press Mfg Co
Mount Gilead, Ohio

...and Directors

DIRECTOR

Henry D Sharpe, Jr
President
Brown & Sharpe Mfg Co
Providence, RI

DIRECTOR

Perrin G March III
President
Cincinnati Shaper Co
Cincinnati

NMTBA MEETING (Continued)

interest to us." Plans are afoot to spend $40 million on this program to provide more elephant and other critical types of tools for emergency requirements.

Only by creating a standby reserve of elephant tools at the earliest moment can the Defense Department insure preparedness in this area, Ralph S Howe, chairman subcommittee on permanent defense capacity and president New Britain Machine Co, pointed out. Obsolescence would not be a serious factor in building up a reserve of these machines. The enormous castings and complex electricals needed for these machines would not be readily available in an emergency and a building program then would be paralyzed or seriously delayed.

Requirements for these machine tools, Mr Howe contended, cannot sensibly be identified in terms of current military end items on existing defense contracts. Surveys of such existing machines reveal that the reserve is woefully inadequate for equipping plants that will produce big military equipment in wartime No adequate subcontract facilities will be at hand to assist or speed the building of these tools in an emergency. Robert Husband, subcommittee member and assistant to the president of Consolidated Machine Tool Corp, has spent much time trying to reactivate the elephant program started in 1952, Mr Howe said.

Vance Plan Spending

The pending expenditure of $100 million for machine tools by the armed services is a recognition of the principles set forth in the Vance Committee plan—that we are better off to increase our capacity to make military end items than to produce great quantities of end items that might become obsolete overnight. But this outlay is not nearly enough, Mr Howe suggested. He further said that the government should replace each year 16,000 machine tools valued at $240 million if it is to keep the national reserve in good shape. This is on the ultra-conservative assumption that the useful life of the 450,000 government-owned machines is 25 years and that 50,000 units are discarded as having no future defense value. The replacement rate thus far has been less than one-fourth that amount. However, Pentagon expects to ask Congress for more funds next year to bring the machine tool buying program back up to the level proposed in the Vance Plan.

Eleven foreign countries are giving some form of effective financial protection to their manufacturers in selling their goods abroad on credit terms, Ralph J Kraut, chairman subcommittee on foreign affairs and president Giddings & Lewis Machine Tool Co, reported. Britain, Germany, Canada and Sweden are among these countries. In Britain the degree of insurance depends upon whether the risk is political or commercial. As an offset, there is encouragement in the recently announced plans of the U S Export-Import Bank to extend credit up to $10 million on a single project. Terms prescribed by the bank are: 25% cash with the order, and assumption by the manufacturer of one-quarter of the remaining 75%.

FOA Grants

Mr Kraut deplored the policy of the Foreign Operations Administration in urging Japanese contractors to buy European machine tools with U S money grants. He expressed the opinion of his committee that the same policy of selling behind the iron curtain should apply to American manufacturers as to those in western Europe, with no trade advantage accruing to the latter. He declared that more and more U S machine tool builders are manufacturing abroad and that FOA guarantees to those investing abroad have recently been liberalized.

If foreign machine tool builders continue to be excluded from U S machine tool shows (though obviously there is a shortage of space at Chicago next year) they are likely, sooner or later, to retaliate by refusing to permit American builders to display in European or British shows, Mr Kraut said. Such refusal could be injurious to export business which today is far below the historic ratio to total business.

Bulletin F—Unrealistic?

The Eisenhower administration has made a good beginning in creating a fair and sound tax structure, but an unrealistic Bulletin F is still a bugaboo, Richard W Banfield, chairman subcommittee on tax policy and executive vice president Pratt & Whitney, Division Niles - Bement-Pond Co, stated. He said that NMTBA continues to believe that some type of optional depreciation will stimulate expansion and modernization of production equipment.

Mr Banfield described the new tax law, especially its depreciation features. He pointed out that under the declining-balance method, as much as 10% to 12% of the cost of equipment may be unrecovered at the end of the useful life. However, the taxpayer has the right to switch at any time, and without consent of the Internal Revenue Service, to the straight-line method of computing depreciation on the basis of unrecovered cost less estimated salvage value and the remaining life at the time of the switch.

A taxpayer and the Internal Revenue Service may agree in writing to a rate of depreciation to be applied to a particular asset or group of assets, he said, and such agreement is binding on both parties until such time as evidence is produced that was not taken into consideration when the agreement was made. Burden of producing the evidence rests upon the party seeking the modification.

Revised M-41?

It is tremendously important for Washington to take adequate action to prepare the machine tool industry and appropriate government departments for a sudden war, Tell Berna, NMTBA general manager, said. Detailed priority regulations—a revised M-41—should be worked out, manpower policy determined, a list of machine tool men who will go to Washington in an emergency with specified assignments should be compiled; and terms of a pool contract decided, with a list of machines to be started immediately in the machine tool builders' shops. There is no reason why the planning and discussion cannot be done now.

Acknowledging the value of the National Industrial Equipment Reserve, Mr Berna declared that "no reserve, however large, can take the place of a strong machine tool industry, big enough to shoulder its responsibility in national defense."

Mr Berna stated that a standard of tests for drilling machines is in the works and that standardization of V-belts and industrial diamonds is making progress. He called attention to a glossary issued by the hydraulic press engineering standards committee. He also described

the standardization work being done by the Aircraft Industries Association in conjunction with machine tool builders. Standards for milling machines, horizontal boring machines, and skin and spar millers are likely to be completed at meetings in Washington early in December. At the same time work will get under way on standards for profiling and contouring machines.

Charles S Davis Jr, chairman of the subcommittee on procurement policies and vice president Lake Erie Engineering Corp, outlined efforts made to eliminate certain defects in machine tool procurement for the government and its prime contractors. For one thing, a uniform machine tool contract combining in a single document all the general conditions and collateral specifications applicable to purchase of machine tools, have been proposed to Pentagon authorities. Such a contract would reduce to a minimum the time necessary for contract negotiations.

Mr Davis, on the other hand, voiced opposition of his committee to standard specifications for machine tools, as suggested by the Defense Department. As a result of protests made to Washington, such specifications will not apply to machine tools other than hand or foot operated shears and punching machines.

The machine tool industry has sought the support of the Hoover Commission on Reorganization of the Executive Branch of the Government in urging that the Armed Services Procurement Regulations (known as ASPR) be changed to incorporate basic agreements with machine tool builders covering continuing procurement of machine tools. Such agreements would go a long way toward eliminating confusion and delay in an emergency. Mr Davis pointed out that "the government places too little reliance on competence, good faith and mutual welfare in machine tool procurement." The existence of basic agreements would relieve contracting officers, who may be new to the job and who may not have heard of the contractor in question, from responsibility for the degree of reliance to be placed on that manufacturer's reputation, Mr Davis concluded.

GM SUPPLIERS AT 21,074 PEAK CURTICE ANNOUNCES

DETROIT—General Motors today does business with 21,074 suppliers throughout the US—more than at any time in GM's 46-year history, it was recently announced by GM President Harlow H Curtice. Previous peak was in World War II, when GM had about 19,000 suppliers.

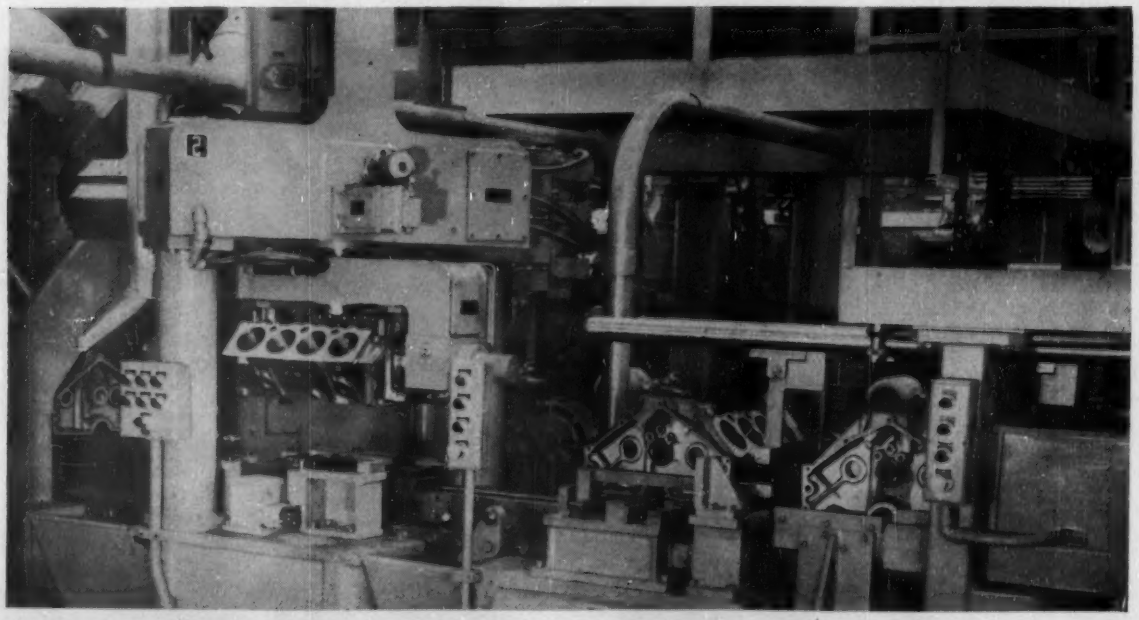
This figure, Mr Curtice said, includes only firms outside GM, and doesn't include the corporation's parts making or accessory divisions.

GM suppliers, he added, are located in every state and range in size from 10-12 employee shops to mass production steel, rubber and chemical companies—representing a cross-section of US industry.

"50¢ of Every Dollar"

About 50¢ of every dollar GM takes in from products sales goes to the supplier for materials, parts, components and services, Mr Curtice said, totaling some $5 billion last year alone.

Michigan, he added, has the greatest number of suppliers—5680.



"Sectionized Automation"

SOMETHING NEW IN AUTOMATION — dividing a machine into sections so that some operations can be shut down without interrupting other operations on the same machine. It's a development worked out by the Cross Co, Detroit, and is being introduced on its new 350-ft-long Transfer-Matic, which performs 555 drilling, chamfering, tapping, camshaft boring and miscellaneous milling operations on V-8 cylinder blocks. Machine produces 100 pieces per hr, has more than 100 pieces in process simultaneously. In this first application of "sectionized automation," machine is divided into five sections — any one of which can be shut down while others continue to operate. The down section can then catch up during lunch hour or an extra shift, since any section runs independently and automatically

AUTOMATION in AUTODOM: Reuther's Ace

Stakes will run high at next spring's bargaining tables — with the controversial Guaranteed Annual Wage as the blue-chip issue. UAW-CIO's Walter Reuther thinks he holds the case ace — automation's effect on the auto worker. Here's why

DETROIT — CIO's United Auto Workers, which has generated more steam for a longer period of time over the Guaranteed Annual Wage than it has over any other single issue, has made it clear that the lever it will use to achieve GAW at next spring's bargaining tables will be automation. A new 12-page report just issued by Walter Reuther leaves no shadow of a doubt as to the union's future position — it intends to make automakers pay the worker whenever and wherever automated processes appear, through the Guaranteed Annual Wage and higher pay for automated jobs.

One auto executive estimates that the UAW demand package would cost the automaker more than 50¢ per hour per worker.

The real surprise in the CIO bargaining package, which otherwise isn't too new or startling, is its attitude toward automation. In effect, UAW finds no fault with automation — as long as workers share in the gains.

UAW's Reuther called attention to Massachusetts Institute of Technology findings to the effect that it's now technically feasible to build a complete auto without the use of manual labor. He added that one noted economist predicts that one man will do the work of today's five men within 10 years.

"These predictions, if accurate," says UAW's report, "would mean . . . that 200,000 men could match the present output of the million UAW members in the auto industry."

Mr. Reuther said he could see only two ways to meet automation's threat to full employment: (1) through government action — leading to dictatorship, or (2) through "voluntary agreement between economic units" (management and unions).

Regarding the latter, the report

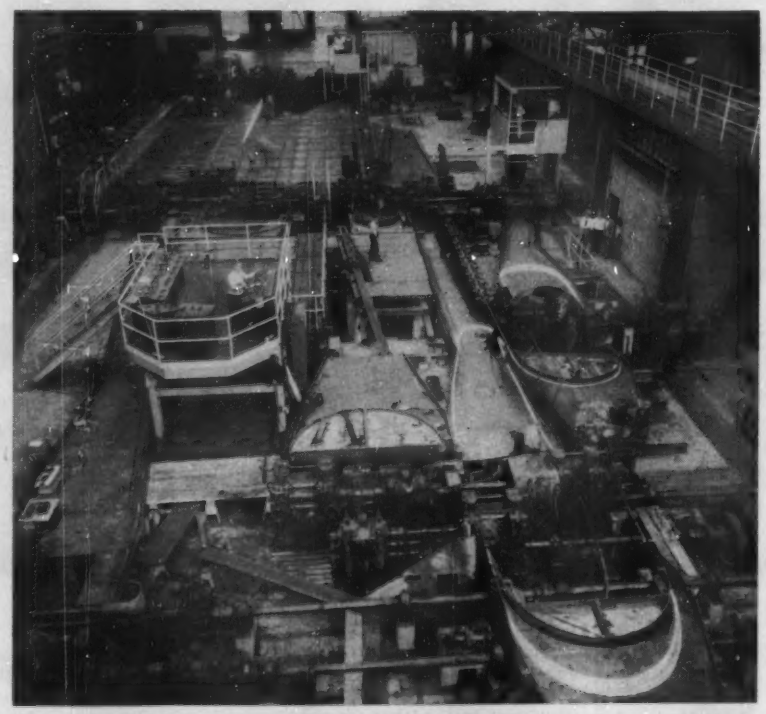
Multi-Purpose Hot Rolling Mill

COGS INGOT, ROLLS STRIP, BAR AND ROD

READING, PENNA — Quicker service to buyers of specialty steels, plus improved product, are being achieved with a new hot-rolling mill just put into operation here by Carpenter Steel Co.

The new facility is planned to offset mill delays when shifting from one size or shape to another— an essential feature at Carpenter, where orders run from a few thousand pounds to a carload, spread over some 200 analyses of tool, stainless and alloy steels.

A carefully designed combination of proved steel mill equipment, some automation features, and modern electrical control gives the new mill its flexibility, Three finishing lines — for bars, coiled rod and strip — follow two billet-breakdown (cogging) mills. Minimum operating loss is achieved by incorporating five finishing points. Thus if the mill has been rolling large diameter bars and additional mill stands are to be readied for rolling a smaller size, the cogging mill can meanwhile supply strip and rod lines.



CONTINUOUS LOOPING METHOD ROLLS RODS. Rod at upper left is in initial breakdown. Loops at right are in finishing stage. Close loop control in a small area aids in size control, makes for a compact installation

In the Hole to Win a GAW Showdown?

says "Management must be brought around to the acceptance of the principle that automated and semi-automated jobs require new classifications and rates, whether in new plants or old."

UAW's international executive board warned locals to resist any attempt by management to "extend existing classifications to cover automated and semi-automated jobs."

Moreover, says UAW, the annual improvement factor of 5¢ an hour doesn't compensate workers for the higher income the union feels its workers are entitled to during "the shift to new modes of production." Any argument that the improvement factor increase will give the workers a share in benefits of automation is "fallacious," UAW says. (Actually, General Motors, originator of the IAF, never said it would.) Large investment-per-worker increases mean more responsibility to the worker and deserve more pay, UAW thinks.

Seasonal aspects of auto output were formerly the basis for Guaranteed Annual Wage demands by CIO — now the peg is automation.

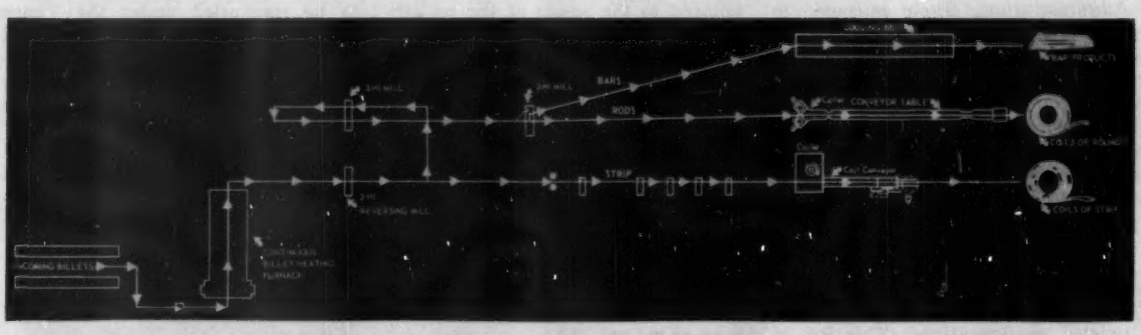
Says the union's report: "Under GAW, management would avoid the introduction of automation in times when major layoffs would result. Introduction of new and more efficient equipment would be geared to periods of expanding markets so that other jobs would be available for the workers displaced by automation."

How would new classifications and wage rates be adjusted to compensate for automation, and who would determine their scope? UAW has no precise answer, other than to say locals should retain "maximum freedom" to exert "full influence" in the shaping of new wage scales. Locals are not to leave the issue to arbitrators. In other words, they are to work out the details with management.

Because of automation, UAW will no longer tie itself to five-year contracts: ". . . the factors have changed since 1950, now automation dictates no more than a two-year agreement."

Said an auto industry spokesman, "There's nothing new about automation except the word. Technological progress began with the invention of the wheel. Advancements have been made ever since. But now, since somebody invented automation, we're asked to pay for a word."

Speeds Output of Specialty Steels



VERSATILE BREAKDOWN MILL makes initial breakdown passes for rolling strip, also cogs the billets from which the strip is rolled. Transfer table is in foreground

TEMPERATURE OF EVERY BILLET IS RECORDED as it is processed. Metallurgist, shown at exit side of breakdown, checks temperature with optical pyrometer

NEW TOOLS FOR THE PLANEMAKER:

They're Being Re-Tailored to Fit Jet Age Machining Problems

Airframe makers and machine tool builders are putting their heads together to come up with new, versatile machine tools with (1) faster speeds, (2) faster feeds, (3) higher horsepower to meet the challenge of new metals and complex contouring

LOS ANGELES—New recommendations for machine tools tailored to the needs of jet-age aircraft production will be ready in the next 90 days, maybe even sooner, it was announced by W A Brainard, Aircraft Industries Association Machine Tool Panel chairman, at a press conference here in November.

The new machine tool specifications are the offshoot of a series of conferences between the Aircraft Industries Association and representatives of the machine tool building industry, held under the sponsorship of the Business and Defense Services Administration. Their purpose: to develop machine tools of higher horsepower, greater speed and feed ranges capable of handling the requirements of new designs and new airframe alloys.

Pre-jet age machine tools used by the aircraft industry were primarily developed around normal industrial requirements for common ferrous metals. As a result, many of them are inadequate to cope with today's aircraft alloys, and with the complex machining of compound curves and twisted configurations. This led in 1952 to the formation of AIA's Machine Tool Panel to "examine the overall problem and determine related tool families within which investigation is immediately necessary." The Panel consists of one man each from Boeing, Chance Vought, Convair, Douglas, Grumman, Hughes, Lockheed, Martin, North American, Northrop and Rohr Aircraft.

First recommendations, developed in conjunction with machine tool builders under the aegis of BDSA, will be for general-purpose mills, horizontal boring mills, skin and spar mills, profiling and contouring equipment.

Machine Tool Panel members conducted an in-plant investigation of each type of tool in each of their plants—taking into consideration new manufacturing problems, and versatility to minimize obsolescence. When all the facts and figures were in, AIA invited machine tool builders in to discuss design changes and make recommendations. The outcome, a practical and realistic set of specifications, will be reported in a compilation to be published by AIA early in 1955.

Here are two examples of what AIA and the machine tool builders are doing to achieve machine tools tailored to the needs of the jet aircraft industry:

- Skin mills and spar mills have been special-purpose tools. Now the idea is to standardize both in two different widths, extendable in length, so that a company can buy a machine for one use, then later convert it to a new use simply by adding such simple components as saddles.
- Maximum speed of current knee- and bed-type mills is around 1500 rpm. When these mills are used to machine aluminum or magnesium, it is difficult to feed at a rapid rate and still maintain chip load. Suggested new design would permit 2-3 times as fast a feed because of higher spindle rpm, and higher horsepower.

AIA says many new machine tool designs can be achieved by adapting the variations that aircraft companies have made on standard machine tools to fit special purposes, then standardizing them and grafting them on to standard types.

Milling machines, made to the new specifications, for example, are expected to achieve 33-50% savings in actual cutting time in the milling of magnesium, according to Mr Brainard.

The Air Force, particularly, will benefit greatly from the new specifications, in that they will assist in procurement planning for in-place machine tools, and for machine tools to be stockpiled under the Vance Plan. Money for the tools is expected to come largely from facilities contracts and what's left of the Vance Plan fund, and from the aircraft companies themselves.

AIA believes the new tools will be useful to subcontractors as well as primes, because their greater versatility will give the sub more adaptability—and they'll be useful to other metalworking industries as well.

NLRB Ruling Hits at IAM

WASHINGTON—AFL's International Association of Machinists has been hard hit by a new NLRB ruling (reversing a 10-year policy) to the effect that an employer can now legally sign a new contract with an incumbent union—even while a rival union has a representation election pending at NLRB.

In a test case, a 3-2 NLRB majority rejected an unfair labor practice charge leveled by IAM at William D Gibson Co of Chicago. Gibson signed a new contract with CIO Steelworkers (the incumbent union) in 1952 while IAM awaited a representation election for 30 toolroom workers IAM wanted to take over. The contract contained a union shop and 17 pro-IAM toolroom workers were fired for refusing to join the Steelworkers. IAM canceled the election and filed charges.

The majority based its policy reversal on "industrial stability"—arguing that an employer should have the right to recognize and bargain with an incumbent union until that union is displaced.

The minority labeled the Gibson affair "sordid," said it gives "every employer a legal formula to destroy any organizational activity by any outside union."

Production Engineering Show To Complement 1955's Machine Tool Show

CHICAGO—Designed to display the corollary products and equipment that cannot be shown at the 1955 Machine Tool Show for lack of space, a new industrial exposition, the Production Engineering Show, will be held in Chicago concurrent with the Machine Tool Show next September. The Production Engineering Show, to be produced independently by Clapp & Poliak, exposition management firm that operates the Machine Tool Show for the National Machine Tool Builders' Association, will be held at Chicago's Navy Pier September 6 through 17, 1955. Buses will shuttle visitors between Navy Pier and the Machine Tool Show at Chicago's International Amphitheater.

The Production Engineering Show, which will be held annually, will display and demonstrate automatic mechanisms and techniques for manufacturing and processing industries, in 200,000-sq-ft space. More than 70 companies have already signed up to display at the Show. Ultimately, 225 exhibitors are expected to participate.

With creation of the Production Engineering Show for 1955, manufacturers of accessory equipment will for the first time have a show of their own, instead of being restricted to the fringe areas of the Machine Tool Show.

Principal categories of equipment to be exhibited will include:

- Monitoring equipment (recording devices and controls, counters and computors).
- Inspection and gaging equipment.
- Communications equipment (signals and telephone, industrial television, radio, teleprinters and facsimile machines).
- Materials handling equipment (conveyors, hoists, monorails, positioners, rotators, unloaders, pneumatic tubes etc).
- Equipment components (cylinders, activators, brakes, clutches, drive mechanisms, motors).
- Machine and product safeguards (x-rays, photocells, limit switches, governors).
- Special production equipment (continuous heat treaters, furnaces, finishing equipment, engineered paint systems, weighing units.
- Details and advance registration cards may be obtained from Clapp & Poliak Inc. 341 Madison Ave, NYC.

Price Tags Aid Tool Care at Clark

RESPECT FOR TOOLS AND MACHINES HAS INCREASED GREATLY at Clark Equipment Co's Industrial Equipment Division — ever since the company conceived the idea of price-tagging all machine tools, hand tools and other equipment. Since employees have found the machine tool they work on costs, for example, $25,000, or that a 4-in.-dia shell mill costs $25, tool breakage costs have been cut 20%, downtime is substantially lower

METAL STAMPINGS OUTLOOK

...an industry looks itself over— finds the future bright

CLEVELAND—"There seems to be no end to the future potential of the metal stampings industry." That's the opinion of the people in the industry, as reported by the Pressed Metal Institute, which backs up its optimistic outlook by pointing to the industry's growth record as reported by Bureau of Census figures.

For instance, the number of firms primarily engaged in job stamping work increased more than 100% in the period 1939-to date. The industry's work force has grown from 57,182 in 1939 to 116,500 in 1952. Wages paid increased six-fold during the same period.

Value of products shipped in 1939 was $326 million, in 1952 it was $1.15 billion. Value added by manufacturers during the period rose from $158 million to $947 million.

In 1939, says PMI, 48% of all those engaged in metal stamping were employed in plants along the Eastern Seaboard, and 41% in the North Central States. Only 3% were employed on the West Coast. In 1947, PMI reports, the West Coast again accounted for 3% of total industry output, indicating that the rate of growth there exactly kept pace with the rest of the industry throughout the US.

The Future

What is the future of the metal stamping industry? PMI sees it this way:

Metal stampers will have to keep up with vastly increased demand for household appliances, for automobiles, for the products and components of US industry in 1960, when US population will have grown to 170 million, with 67 million employed, with 51 million homes in existence. This all adds up to a $410 billion Gross National Product in 1960 (current GNP is at $360 billion —an all-time high); a National Income of $348 billion with disposable income of $280 billion; and annual spending for new plant and equipment at a rate of $30 billion a year. And the metal stamping people, says PMI, will be ready to meet a steadily increasing demand.

MAGNESIUM ASSOCIATION MEETS:

Hot-Chamber Die Casting Holds Spotlight...

. . . along with successful arc welding of magnesium with consumable electrodes. These were the top production topics at the Magnesium Association's 10th Meeting at St Louis

ST LOUIS—The Tenth Annual meeting of the Magnesium Assn, held here Nov 15 to 17 drew more than 300. Major reason for shifting the meeting here was to include a plant trip to the new Dow integrated mill for magnesium sheet and extrusions located across the river in Madison, Ill (*AM*—June 7, '54, p176).

Major interest at technical sessions was in reports on several developments in production methods. Paul Klain of Dow reported on studies in arc welding magnesium with consumable electrodes, inert shielded. Previous attempts had not been successful, but the introduction of constant-potential power sources especially designed for the process have improved operating conditions and make the welding of magnesium practical. Welding speeds were 24 to 36 ipm with a high deposition rate. Properties of welds are equal to tungsten-arc welds.

Hot-Chamber Die Casting

Hot chamber die casting of magnesium, long rumored in the industry, was finally admitted by Dow in a paper by F C Bennett. Successful commercial application would open the economies of the hot-chamber process to the light-metals field for the first time.

Work started with a conventional 70-ton zinc hot-chamber die casting machine and then a 400-ton machine was built. As the operation now stands, there is a supply pot or holding furnace from which there is a siphon pipe leading to the injection gooseneck. An electrical level device controls level of molten magnesium in the gooseneck. A hydraulically operated piston forces the shot through a closed injection gooseneck as in the conventional zinc machine. The method is said to provide virtually complete metal protection, low injection pressure, and automatic control of metal supply.

Dennis Goddeyne of Goddeyne Mfg Co reported on commercial experience in electroplating magnesium. Where difficulty has been found with adhesion it is usually traceable to the zinc-immersion step and a less concentrated bath with slower application is the solution.

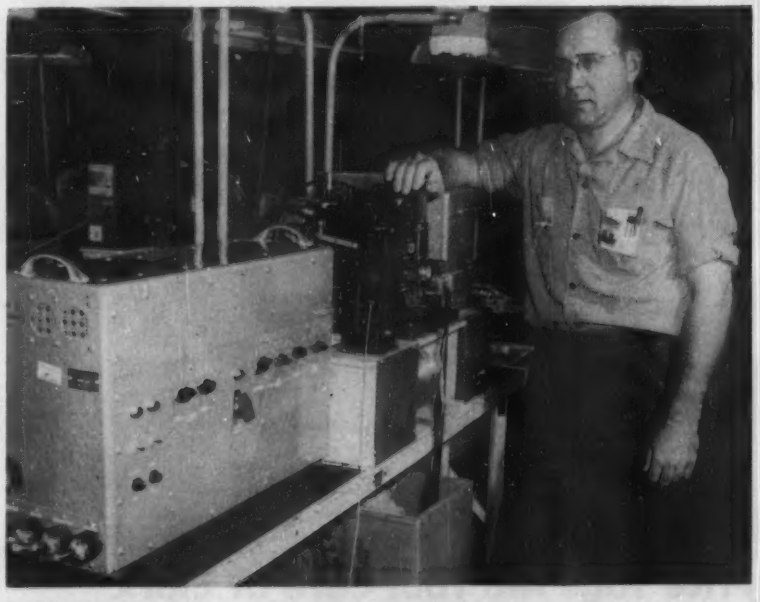
Officers elected at the annual business meeting are Dan T Wellman, Wellman Bronze and Aluminum Co, president; J E Pepall, Magnesium Co of Canada, vice president; re-elected were J V Cosman, treasurer; Jerry Singleton, executive secretary, and Martha Hansen, asst secretary.

SEES POSSIBLE PEAK YEAR AHEAD FOR TOOL AND DIE INDUSTRY

HARTFORD, CONN—The US tool and die industry may do as much business next year as it did in peak 1953, Jack Kleinoder of Volkert Stampings, Queens Village, NY, told a Forecast Forum of the Central Connecticut Tool & Die Industry here.

But, Mr Kleinoder told some 70 Connecticut and Massachusetts shop owners, this optimistic outlook depends upon the individual shop's getting its share of the business through progressive practices. Every shop owner, he said, should ask himself if he has too much old equipment, if he's keeping abreast of latest developments, if he's training a skilled labor force, and if he's takthe lead in some specific field. Tool and die busines for 1955 and for all time to come depends upon the answer to these questions, he said.

Mr Kleinoder added, "Fair competition is good for us—it keeps us on our toes. Cut-throat competition . . . leads to ruin."



Wire Cutter-Stamper-Measurer

DEVELOPED BY DOUGLAS AIRCRAFT LEADMAN GLEN LYDOLPH, this electronic, pushbutton machine cuts, stamps and measures electric wire in one operation at Douglas's Santa Monica, Calif, plant, where more than 16 miles of such wiring goes into a single DC-6/7 transport plane. Device greatly reduces assembly time by eliminating five manual operations

Report to Congress on Defense Production

Joint Committee doesn't like the haphazard way the Armed Services furnish contractors with machine tools. Furthermore, it thinks the government's "right hand knoweth not what the left hand doeth" policy regarding leasing of US tools for civilian use should be cleared up once and for all

WASHINGTON—A report shows concern . . . "over the manner in which government-owned tools are furnished to contractors in performance of procurement contracts." That's just one of several bones the report has to pick with government handling of defense production problems. Another is the lack of clear-cut policy regarding leasing of machine tools for civilian work.

Report Now Out

This attitude on these and other defense problems came out in the recently published Annual Report of the Joint Congressional Committee on Defense Production. Here are its highlights:

General Defense Dept policy is to have military contractors furnish their own tools and facilities. But in the case of special tools with little commercial utility, the government provides production equipment. Defense Dept policy also states that "such an arrangement is not to place the contractor in an advantageous position competitively."

This is the problem area with which Congress is concerned. The Joint Committee's main gripe: lack of standard policy among the three services, who allow individual contracting officers to determine what tools, if any, should be furnished contractors.

The result, says the report, is that contractors using government tools "may enjoy distinct advantage cost-wise over the contractor having capital investment in his own tools" —especially when a contractor has more than one contract for which he can use the same tools.

The Committee recommends that (1) government-owned equipment be made available to all contractors on the same competitive basis, and that (2) standard leasing rates and procedures be set up and applied uniformly by all services on any machine tools supplied in performance of a defense or defense-supporting contract.

The Committee also criticized Office of Defense Mobilization's Mobilization Order VII-4, which generally bans use of idle government tools for non-defense work, but which allows exceptions. Congress's criticism is aimed at the lack of clear-cut policy on whether government-owned tools should remain on lease when a contract is ended.

The Commerce Dept, the report reveals, says it's unfair to industry to allow government-owned tools to remain in plants—except for a few extremely-large elephant tools which would be uneconomic to move. Commerce Dept has proposed a rule-of-thumb: only tools worth at least $100,000, requiring 18 months or more to build— or where dismantling or moving would substantially damage the equipment—should be left in contractors' plants. General Services Administration thinks so, too.

The Defense Dept's stand on this question: "Where circumstances make it necessary to permit the restricted use of some of the tools for non-defense work in order to assure the location and maintenance of all the packaged tools in the plant, it is in the best interest of our national security to make such agreements."

The Committee makes no specific recommendations on this point. But the implication is that leasing should be restricted.

Also announced in the report was the fact that all machine-tool pool orders are now completed. Latest figures show that 115 contracts were signed under the program, covering 94,225 tools worth about $1.4 billion. More than 87,000 of these tools have been sold directly to defense contractors, and some 6400 have been canceled with producers. The government's liability: 711 tools taken into storage at a cost of $9.4 million. Of these, 338 are strictly special single-purpose machines built for the military.

Latest figures on the Facilities Expansion Program show that 120 agreements were signed, committing the government to liability for more than 3200 machines worth $38.8 million. Practically all deliveries have been made. Exceptions are a few long lead-time items. Of all tools delivered, only 85 have been put in storage because of cutbacks and cancellations.

AMA Slates Executive Communications Course for '55

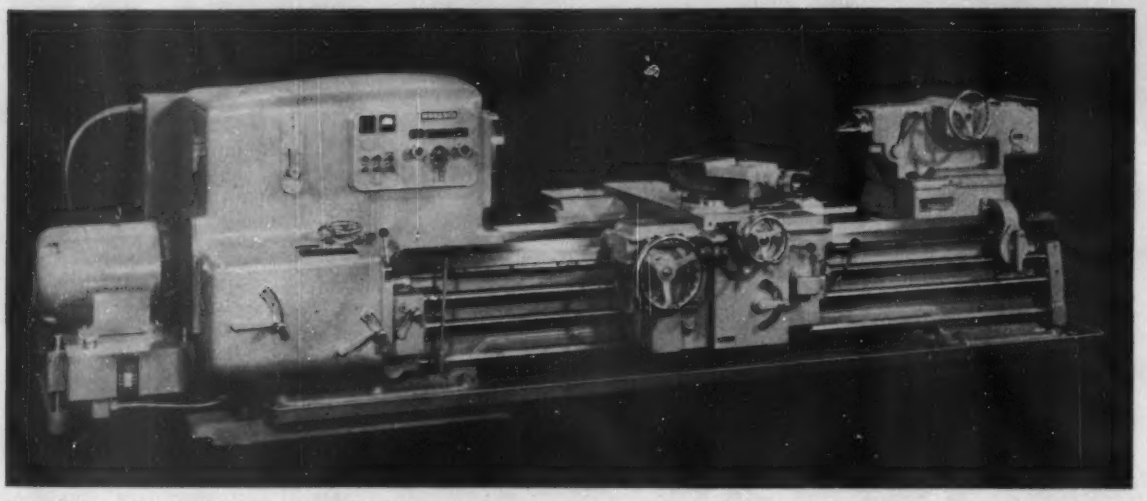
NEW YORK—A three weeks' course in Executive Communications will be held here at the Sheraton Astor Hotel beginning January 24, 1955, under the sponsorship of the American Management Association.

AMA say it expects more than 500 business and industrial executives to attend the course, which has been launched by AMA in response to requests from firms all over the country who say that executive communication is their No. 1 management problem.

The course is not designed for personnel or communication specialists, but for operating executives in positions requiring communications "skills of a high order." Objectives of the course are to help executives improve their ability to identify and clarify ideas, secure participation, transmit ideas and decisions, motivate others to act, and measure the effects of communication.

Conference Group Sessions

"Students" will get both instruction and practice in these fields. AMA's course will emphasize small conference group sessions, where participants will work out communication problems that arise in their normal operations, says AMA.



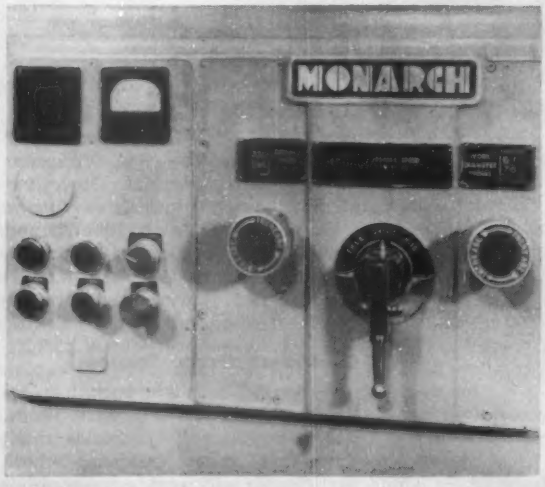
NEW HEAVY-DUTY LATHE, Series 90 Dyna-Shift, is offered in three models, each with main drive motor capacity of 60 horsepower

Monarch Dyna-Shift Automatically Sets Spindle Speed

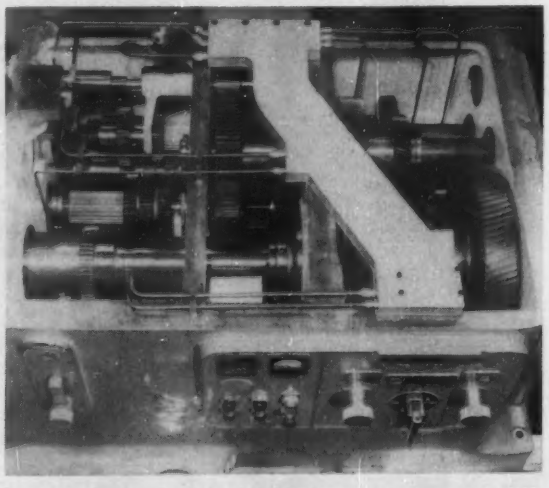
The Monarch Machine Tool Co has announced a new heavy-duty lathe designed specifically to use carbide tooling to fullest advantage. Model 2500 swings 25 in. and has a clearance diameter of 40 in. Models 2501 and 2502 have swing of 31½ and 36½ in. and clearance diameter of 44 and 48 in. respectively.

The main feature is the Dyna-Shift headstock illustrated below. When the control lever is thrown to "shift" position, spindle rotation stops immediately. A signal means inside the headstock will not permit the gears to shift until the gear train is stopped. With the lever in "free" position, the spindle may be rotated by slight pressure of the hand. Work stop and start is controlled by dual levers. Forward position is "run," vertical is "brake," and pushed back toward the machine is "jog." Brake and clutch are both hydraulically operated. At no time is there a speed step-up in a gear pair.

Numerous safety factors are incorporated in the Series 90 design. Even though the start-stop lever is pulled forward to "run" with the

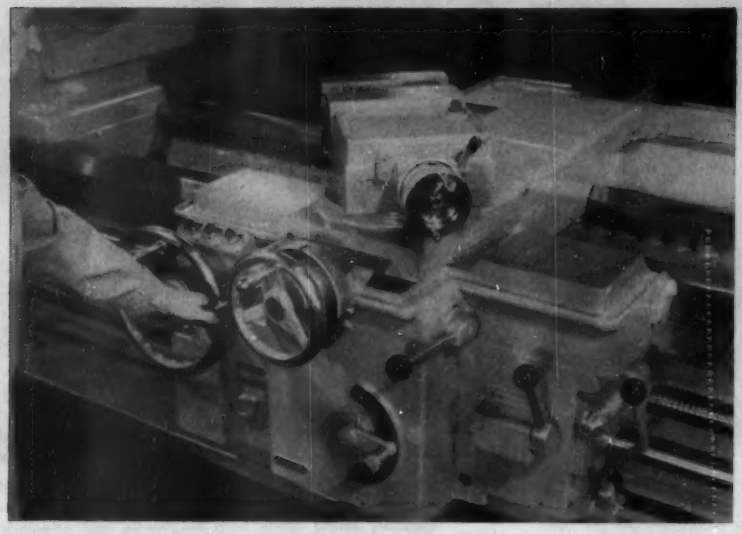


DYNA-SHIFT control lever has three positions. In "shift," spindle rotation stops. Two dials, left and right of lever, are set for surface cutting speed and work diameter. Automatically . . .



HEADSTOCK GEARS shift hydraulically to give correct spindle speed. Front compartment carries gears providing drive to spindle. They are wide-faced helical gears on tapered roller bearings

Materials and Parts . . .



CONTROLS, concentrated at the apron, include: work start-and-stop lever, half-nut lever, levers which operate longitudinal and crossfeed frictions, apron and crossfeed handwheels, and carriage power rapid traverse buttons. Dual start-stop lever is located on headstock

Dyna-Shift control lever in "shift," work rotation will not start. It is impossible to engage the clutch with control lever in "free" or start-stop lever in "jog."

Designed for increased productivity, the lathe has 36 spindle speeds from 6 to 750 rpm. The end gearing of the end gear train is located on a quadrant and on studs having fixed centers. This allows changing of gearing for chasing odd leads or substitution of Metric transposing gears. The gearbox provides a range of 48 common threads and feeds. Range of threads per inch is ½ to 28 and range of feeds per revolution is 0.0035 to 0.196 in.

Both the end gear train and gearbox are totally enclosed and automatically lubricated. Lubrication of all headstock gears and bearings is through a high-pressure mist system.

Drive to the headstock is through multiple V-belts. The motor base, on the outside of the machine, can be moved vertically for adjustment of V-belt tension. Base is hollow and contains hydraulic pump and oil sump for supplying power to operate headstock gears.

The carriage of the Dyna-Shift lathe has heavy wings and massively ribbed bridge. Carriage and cross-slide dovetails extend farther toward the front than is customary, giving added room for bulky tooling. Individual motor-driven carriage power rapid traverse is supplied for both directions of travel. This unit is hung from rear of carriage and pushbutton controlled from apron. Traverse is at 185 ipm and an inching feature is included.

The large compound is practically as wide as the bottom slide. It has an integral cast ridge around the edge to direct coolant away. Effective movement of the compound is 7 in. and it may be swiveled 360°.

The tailstock base has a max set-over of ½ in., front and back. It is hand-scraped to its own flat and V-way which are flame-hardened and precision ground. A pawl is mounted in the base for engagement in the back-up rack. Tailstock spindle is 7 in. in dia and has an anti-friction bearing mounting for live tailstock center. It is provided with two speeds of travel through a gearbox on the right.

Bed castings are fabricated from chromium alloy cast iron, flame hardened to depth of ⅛ in., to Scleroscope reading of 70-72 Shore—then ground to tolerance of 0.001 in. in over-all length.

The Monarch Machine Tool Co, Sidney, Ohio

. . . including

Crankpin grinder, transfer type, has production output equal to 4½ to 6 times that of conventional semi-automatic crankpin grinders . . . page 198

Milling machine line offers three models with choice of manual, power, or heavy-duty spindle heads . . . . . page 199

Hobbing machine, automatic, horizontal type, is tooled for cutting automatic transmission gears . . . . . page 200

Milling machine incorporates movable ram in place of conventional overarm to allow universal operations . . . . page 202

Horizontal boring mills, table-type, incorporate movable pendant station providing all functional controls . . . . . page 204

Sectionized automation design allows shut-down of one station while others remain in operation . . . . . page 206

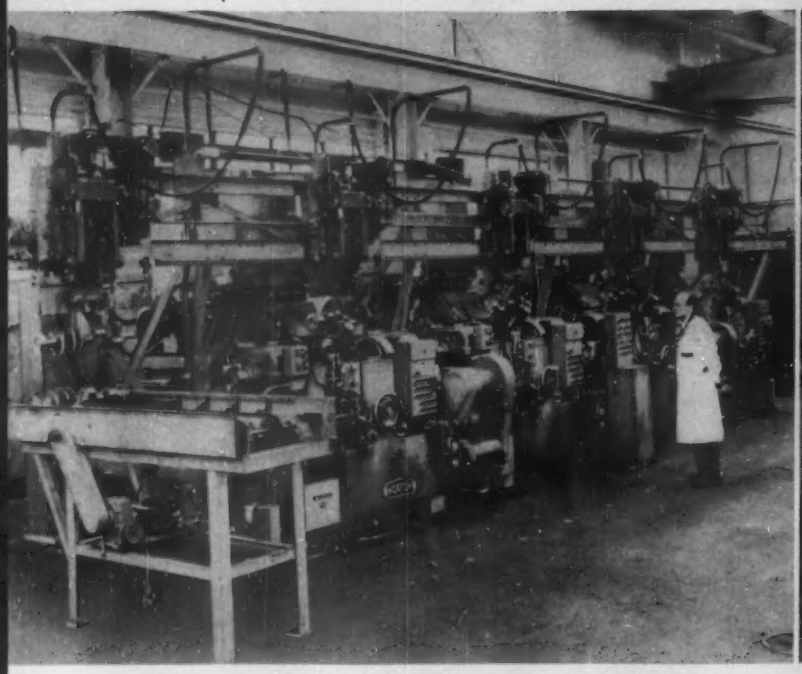
Milling head, universal, does multiple operations . . page 208

Arc welding process offers high efficiency . . . . . page 210

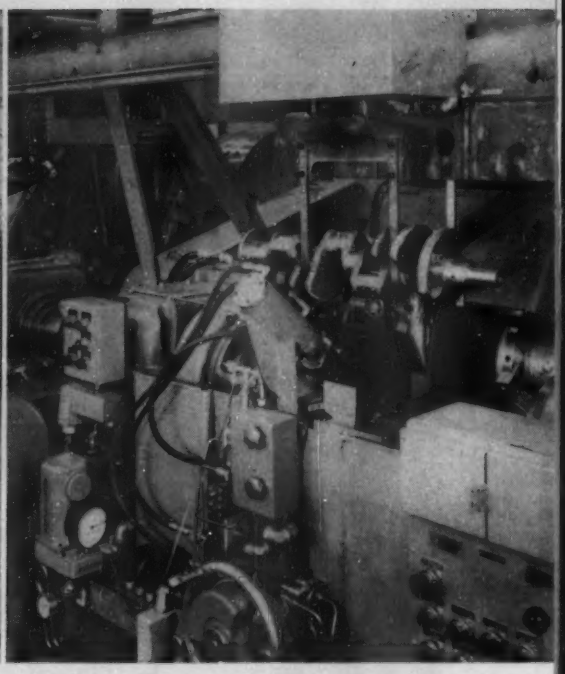
. . . and in Dec 22

Universal grinder handles cylindrical and internal work.

Lathe achieves variable spindle speed by pushbutton control.



AUTOMATED CRANKPIN GRINDER—over-all view taken during construction. Operator is standing before central control station. Individual station controls are used during setting up operations. Work travel is from left to right



GRINDING STATION is one of four. Size is controlled by air snap gage just below crank. Workholders automatically locate crank both lengthwise and angularly

Norton Transfer Type Crankpin Grinder Performs Six Times Normal Production

The first completely automated crankshaft-pin grinding machine is basically a four-station, four-wheel machine for V-8 shafts. It can be applied to six-cylinder shafts by adding two stations. Cranks are picked up from conveyor at left end and transferred through each station before being placed on far-end conveyor.

Each station contains a loading hook for rough angular orientation. When shaft is deposited, a rotating cam locates it longitudinally and an arm adjusts it angularly. Final angular position is determined by locating pin.

Each grinding wheel has an automatic truing mechanism which will true the wheel face and radius at each corner. Automatic compensation is provided for amount of abrasives removed at each truing, and wheel drive motors are arranged to vary their speed to provide constant peripheral speed.

HIGH PRODUCTION

Depending on crankshaft design and processing details, possible production rate runs as high as one V-8 shaft per minute. This rate, from 45 to 60 shafts per hour, is equal to the output of from 4½ to 6 conventional semi-automatic crankpin grinders. Wheelslide motion can be controlled to produce work diameters, under automatic control, within a tolerance of 0.0002 in.

CONTROL STATIONS

Incorporated in the design are interlocks and controls obtained by providing a central station to control each individual station. The work diameter senses the completion of the cycle from its own accuracy. The cycle includes automatic control of the rate of infeed of the grinding wheel, the operation of the steady-rest, as well as the selection of the frequency of truing.

Consideration has been given to such problems as the ability to cut out any single station for servicing and also to minimize the problem of disassembly. In addition to the massive wheelslide unit, the wheel spindle design—with the wheel mounted between bearings—is reported to be unique and to provide five to seven times longer wheel life. Provision has been made to permit adjustments of the various feeds and speeds and to lock these controls as set.

Many of the units incorporated have been time-tested through prior use in other machines. The workholders, work heads, work drive mechanism, wheel feed control devices, truing devices, and interlocking controls—all have had prior experience. The work handling equipment, together with the radial and longitudinal orientation devices, were proven by construction of a prototoype.

SPECIFICATIONS

The TTCG occupies a floor space of 45x21½ ft. It is 11-1/3 feet high and weighs about 140,000 lb. Driving power totals 139 hp. Four 25-hp dc variable-speed motors drive the four 42-in. crankshaft grinding wheels at a constant peripheral speed. Two 5-hp motors drive the four work heads; two 3-hp motors drive the hydraulic equipment. Four ½-hp ac dynamic braking motors are used in the transfer system. In addition, four oil motors accurately position the workheads for loading. JIC hydraulic and electrical standards have been met.

Norton Company, Worcester 6, Mass

Three New Cincinnati Toolmaster MM's Offer Manual, Power, or Heavy-Duty Spindle Heads

The Cincinnati Milling Machine Co has introduced the Toolmaster, a new milling machine for toolrooms, repair depots, tool and die shops, pattern shops, and other metalworking companies. The machines are available in three styles—1A, manual feed to quill; 1B, power feed to quill; and 1C, heavy-duty head. Standard ranges are: longitudinal, 16 in.; across 10 in.; and vertical, 17 in.

CONSTRUCTION DETAILS

The overarm is patterned after the familiar Cincinnati design and mounted in dovetail ways in the turret unit. This permits the operator to position the overarm for complete coverage of the table with the spindle head. The square-gibbed saddle-knee bearing, patterned after larger machines, is a factor in the ruggedness of the machines.

The knee takes its bearing in the two V-surfaces formed between the dovetail guide and the column face. In keeping with rugged design, saddle is more than half the table length.

An anti-backlash device on the table feed screw consists of a double nut arrangement, one threaded to the other. Two screws allow backlash adjustment.

High degree of operating convenience is attained in several ways. Clamps for the table, saddle, and knee are lever-operated. Micrometer dials are extra-large with widely spaced graduations. Each end of the table is equipped with a table traverse handwheel. The spindle head can be swiveled left or right for taking cuts up to 90°.

SPINDLE HEADS

Toolmasters 1A and 1B are equipped with built-in micrometer quill stop for depth adjustment. Lever-operated quill clamp is located at front of spindle head. Angular positioning of head is accomplished by worm and wheel arrangement having crank extension. Spindle nose is collet chuck type which receives collets from ⅛- to 1-in. dia. No. 1B has a two-position feed-engaging knob extending from front of head. Feeds are 0.002 or 0.006 ipr.

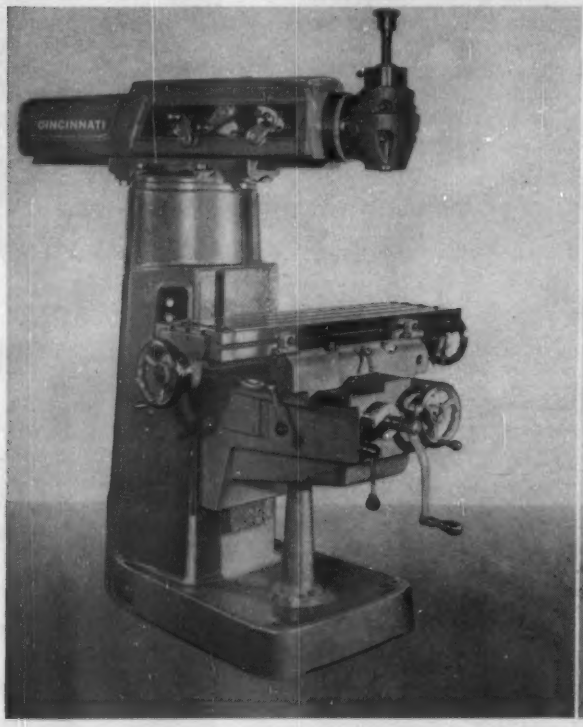
These standard head machines have eight spindle speeds, selected by changing one or two belts. Choice of three ranges: 108 to 2845, 140 to 3800, or 215 to 5650 rpm. Low-range machines are powered by ¾-hp motor, others by 1-hp.

HEAVY-DUTY HEAD

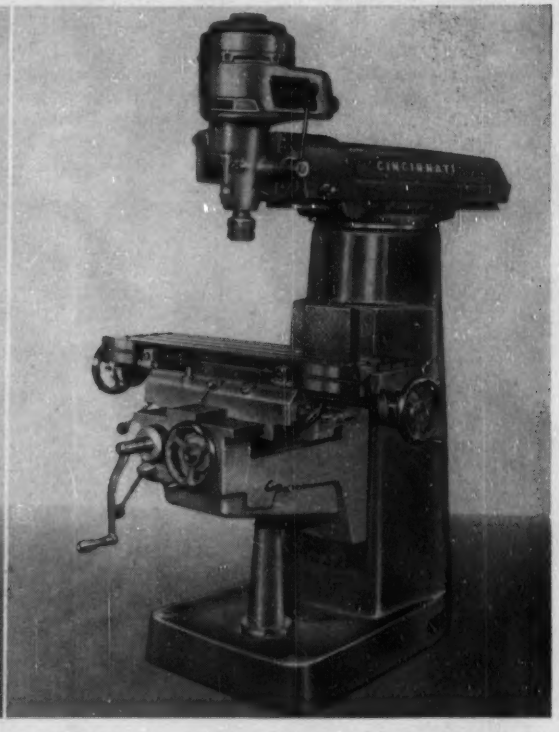
The 1C machine allows selection of eight speeds by levers through sliding gears. Range is from 100 to 1530 rpm. Like the other machines the spindle head can be swiveled left or right. An intermediate unit may be added to provide swivel adjustment at right angle.

Several attachments are available, including a self-contained motor-driven shaping unit which can be mounted on the overarm of any Toolmaster. The turret design allows the attachment to remain on free end as long as desired.

The Cincinnati Milling Machine Co, Cincinnati 9, Ohio

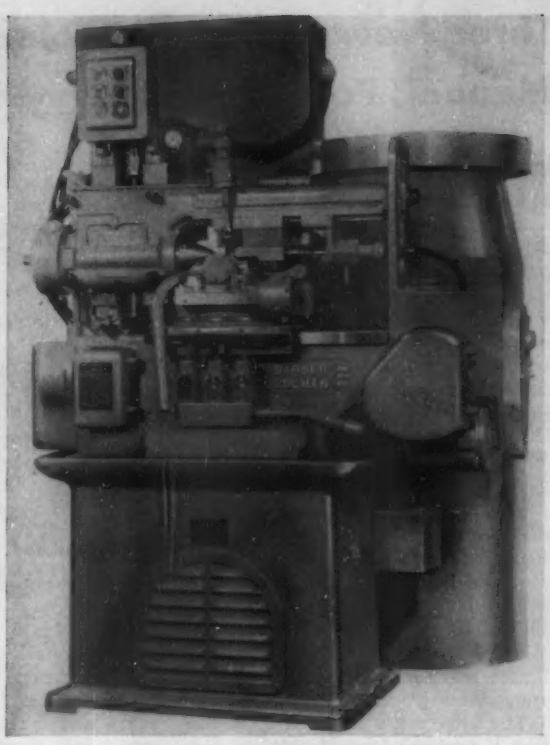


MODEL 1C is equipped with a heavy-duty spindle head which can be swiveled to left and right. A can-type 2-hp motor, mounted in the rear end of the overarm, drives spindle through a gear train



MODEL 1A, with manual feed to quill, and Model 1B, with power feed, are equipped with pancake-type motors integral with the spindle head. Eight spindle speeds are selected by changing belts

Automatic Hobbing On Barber-Colman Horizontal Machine



Barber-Colman Co has announced another completely automatic hobbing machine, the No. 6-10, tooled for cutting automatic transmission gears on a high production basis. The machine is a horizontal hobbing machine with solid overarm for maximum rigidity. It operates automatically through a combination of mechanical, hydraulic, and electrical movements. Feed, index, and hob speed are mechanically governed through a gear train and change gears, as on conventional Barber-Colman machines. The work slide movements, automatic clamping, and arbor-loading are hydraulically operated, while cycling and rapid traverse are electrically actuated. Automatic loading is accomplished through a vibratory hopper-feed system.

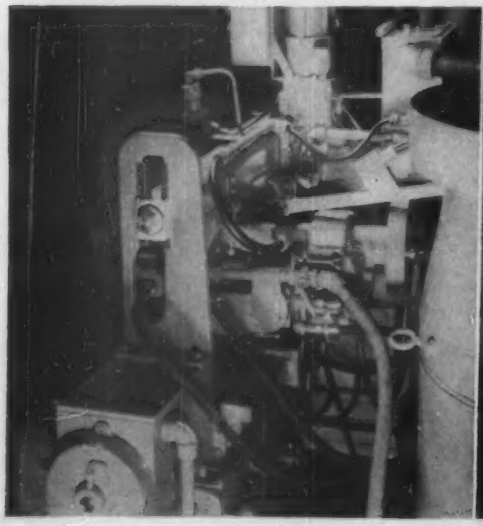
In the complete cycle sequence, blanks are automatically loaded, hydraulically clamped in cutting position, hob is rapid traversed to the hobbing position, work slide is lowered to cutting depth, gear is hobbed, work slide is raised to clear hob, hob is rapid-traversed away from cut, and finished gear is ejected automatically. A new blank is then loaded and the cycle repeats.

One of the tooling features on the machine is the automatic, hydraulically operated hob shifter which increases the cutting life of the hob, while eliminating the necessity for manually moving the hob to new cutting positions. The shifter moves the hob to a new position after each gear is cut. Shifts are made automatically in increments best suited for the operation.

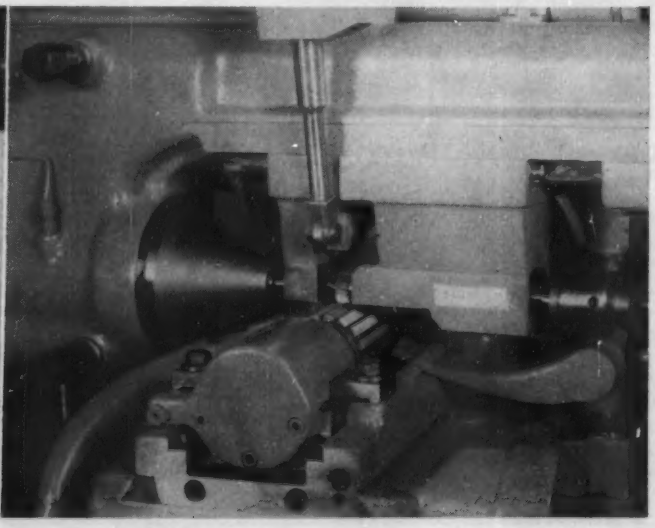
Another feature of the machine is metered hydraulic pressure which assures positive arbor mounting and finished gear ejection. The fact that blanks are loaded on a solid work arbor assures positive control over gear accuracy. This arrangement eliminates chances for looseness, runout, or vibration.

A combination of electric limit switches and program motor governs the automatic cycle. This arrangement is adaptable to many similar long-run gear cutting operations within the general range of 16 pitch and finer, depending upon the particular gear specifications and production requirements. The cycle is arranged to suit the requirements of the job, and tooling, feed, speed, and cycle timing depend on the required production and the gear specifications.

Barber-Colman Co, Rockford, Ill



ARBOR-LOADING mechanism, hydraulically actuated, is fed blanks by the chute in center foreground. Note the solid overarm brace which provides high degree of rigidity



HOB SHIFTER, also hydraulically actuated, moves the hob to a new cutting position after each gear is cut. Finished gears are automatically ejected through tube in foreground

QUICK ADJUSTMENT..ON THE MACHINE!

For high-speed service on live spindle machines, the KD Rotar[illegible]lf-Opening GEOMETRIC Die Head is compact, accurate, well balanced . . . made for long, trouble-free life. Chasers are adjusted merely by loosening a Binding Screw and turning Adjusting Ring for desired size. No need to take the head off the machine, even to change the chasers.

Available in seven sizes for #0 to 2½" diameter threads. Hollow shanks allow threading to any length. A positive-opening flange trip provides for repeat threading to identical lengths.

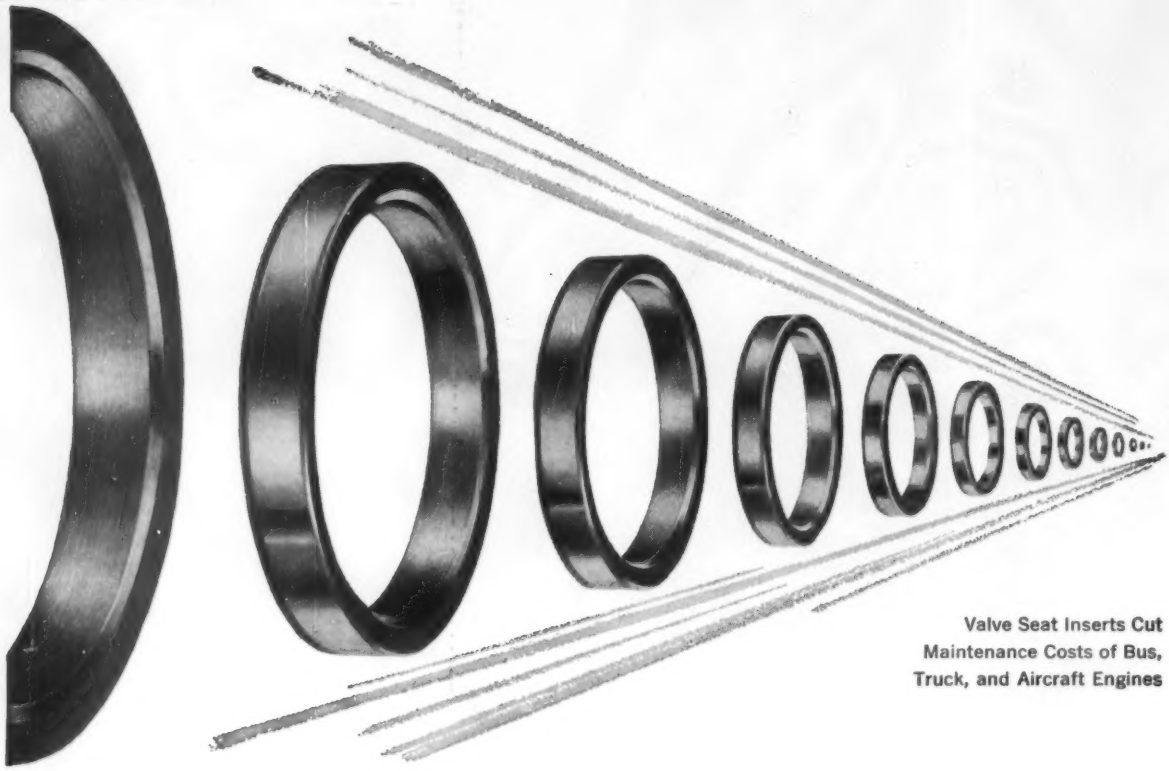
Write for full details. Specify Bulletin KD

Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

NEW HAVEN 15, CONNECTICUT

GEO MET RIC



Valve Seat Inserts Cut Maintenance Costs of Bus, Truck, and Aircraft Engines

200,000 MILES BETWEEN GRINDS

Valve seat inserts made from HAYNES STELLITE alloy have given as much as 200,000 miles of service in truck engines before regrinding was required. These inserts stand up under continuous impact without cracking. They won't stretch or distort even under abnormal operating temperatures, and will retain their hardness even at high temperatures.

RESIST WEAR . . . CORROSION . . . OXIDATION

The wear, corrosion, and oxidation-resistant qualities of HAYNES STELLITE alloy valve seat inserts further insure peak performance at low maintenance costs. These cobalt-base parts resist the erosive effects of hot exhaust gases. They are practically unaffected by corrosives present in the fuel, and will not pound in at high operating temperatures.

AVAILABLE IN A VARIETY OF SIZES

The inserts can be supplied in a variety of sizes for use in bus, truck, aircraft, marine, and other types of internal combustion engines. The unusual properties of HAYNES STELLITE alloy make it possible to produce efficient inserts as thin as 5/32-in. in cross-section. Use of these thin inserts enables the engine designer to locate water jackets closer to actual valve seating surfaces, and provide a more effective cooling system.

For full information on sizes, and prices, write to Haynes Stellite Company, 725 South Lindsay Street, Kokomo, Indiana.

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HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

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FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 GRINDER—*Landis Tool Co, Waynesboro, Pa.* 16-page catalog A-54 describes the 4-in. plain cylindrical hydraulically operated unit for handling wide variety of small parts.

2 CIRCULAR SAWING — *Motch & Merryweather Machinery Co, Cleveland 13.* 8-page catalog illustrates and describes equipment, including 6-model line of sawing machines, Triple Chip blade, and saw blade grinders.

3 MICROHONING — *Micromatic Hone Corp, Detroit 32.* 31-page catalog contains illustrated data on specialized equipment and engineering service. Lists advantages of process, describes tools, fixtures, and abrasives.

4 POWER PUNCH PRESS — *Klaus Machine & Mfg Co, Cleveland 25.* 4-page illustrated bulletin gives features of the Emco bench-design unit.

5 ROLLER LAPPING MACHINE — *Spitfire Tool Co, Chicago 41.* Bulletin covers Model 12, describes functions and process, provides specifications.

6 RIVETING & DIMPLING MACHINE—*Lemort Engrg Co, Plymouth, Ind.* 6-page folder describes Airflex pneumatic units operating on rotating-spinning-impact principle.

7 BORING, DRILLING, MILLING MACHINE—*Cincinnati Gilbert Machine Tool Co, Cincinnati 23, Ohio.* 14-page bulletin 954 pictures and describes floor model horizontal units. Contains specifications, design details, illustrates variety of arrangements.

TOOLS AND ACCESSORIES

8 DIAMOND GRINDING WHEELS & HONES—*Norton Co, Worcester 6, Mass.* 52-page catalog 1233 contains comprehensive assortment of standard sizes. Provides information on markings, selection, shapes, suggestions on use, and price listings.

9 DIESETS — *Lempco Products, Bedford, Ohio.* 192-page catalog, divided into seven tab-indexed sections, covers over 800 sizes of ball bearing precision and super precision anti-friction diesets, guide post assemblies, and accessories.

• ABRASIVE WHEELS — *Wallace Tube Co, Chicago 14.* 40-page illustrated, pocket-size book on causes and prevention of wheel failure. Request direct on company letterhead.

10 CARBIDE-TIPPED TOOLS — *Cleveland Twist Drill Co, Cleveland 14.* 24-page book gives data on recommended speeds and feeds for drills and reamers, illustrated instructions for regrinding, and information on use and care.

11 KNIVES & BLADES—*Ohio Knife Co, Cincinnati 22, Ohio.* Spiral-bound catalog 22 illustrates and describes all company's products, including slitter knives, spacers, shear blades, ways, gibs, wear plates, work rest blades, and tools. Includes tables, specifications, and ordering information.

12 AUTOMATIC DRILL UNIT — *Dumore Precision Tools, Racine, Wis.* 16-page illustrated "Operations and Service Manual" describes technical operations and maintenance of Series 24. Includes table of recommended pressures and speeds with detailed dial settings, and two-page service chart for rapid maintenance.

13 WHEELS — *Carborundum Co, Niagara Falls, NY.* 4-page illustrated brochure "V40 for Tool Room Grinding" describes complete line for every type of toolroom operation. Includes separate chart with recommendations for grinding high-speed tool and die steels.

14 CLAMPS — *Adjustable Clamp Co, Chicago 22.* 32-page catalog 19 contains illustrated data on Jorgensen and Pony line. Describes over 40 styles of C and bar clamps, handscrews, press screws, and similar tools. Includes information on selection, care, and use.

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FOR YOUR INFORMATION

15 HAND TOOLS—*Blackhawk Mfg Co, Milwaukee 1, Wis.* 86-page illustrated catalog W-101 covers wrenches, screwdrivers, pliers, pullers, and similar mechanic's tools. Includes specifications, capacities, selection data.

16 BROACHING FIXTURES — *National Broach & Machine Co, Detroit 18.* 12-page catalog B54-9 describes Red Ring self-contained, air-powered bench models. Typical applications illustrated.

17 TAPS & DIES—*Threadwell Tap & Die Co, Greenfield, Mass.* Three net price selectors include illustrated descriptions of lines of taps, dies, counterbores, and keyway broaches.

PLANT-SERVICE EQUIPMENT

18 PUMPS — *Ingersoll-Rand Co, New York 4.* 19-page bulletin, Form 7074-D, illustrates features of circulating and coolant Class KRV & KRVS Motorpumps. Has performance curves, cross-sections, dimensions, descriptive material for each class.

19 TRUCKS — *Lewis-Shepard Products, Watertown, Mass.* 6-page illustrated brochure, "6-Way Procurement Plan," explains program for obtaining trucks by leasing, time-payment, short-term rental, trial, trade-in, and outright purchase.

20 BALL BEARING TROLLEYS — *Link-Belt Co, Chicago 1.* 19-page booklet 2536 illustrates and describes Series 500 for overhead conveyors. Includes features, selection data, specifications, application, and maintenance information.

21 PRESSURE BLASTING — *Cro-Plate Co, Hartford 1, Conn.* Two technical bulletins available: "Cleaning Prior to Electro-Plating with Pressure Blast," and "Deburring with Pressure Blast." Both applications described in detail. Manually operated and automatic equipment illustrated.

22 BRIGHT-COPPER PLATING — *Lea Mfg Co, Waterbury 20, Conn.* 23-page Technical Manual on Copper-Glo process. Describes method, operation, chemical additions.

PARTS AND MATERIALS

23 CHROME-NICKEL ALLOY STEELS —*Carpenter Steel Co, Reading, Pa.* 13-page illustrated bulletin describes No. 158 and No. 5-317. Covers physical properties, stock sizes available, typical uses, working instructions.

24 AIR-GRIP CLUTCH — *Dodge Mfg Corp, Mishawaka, Ind.* 4-page illustrated bulletin A-634 lists features, explains operation, shows internal construction, gives sizes, dimensions, selection data, prices.

25 FLUID POWER EQUIPMENT—*Oilgear Co, Milwaukee 4, Wis.* 12-page bulletin 10051-D illustrates and describes line of pumps, motors, transmissions, cylinders, and valves. Specifications included.

26 VALVES—*Ross Operating Valve Co, Detroit 3.* 20-page illustrated bulletin 303-B describes 600 and 800 series of hand and foot units. Provides installation data, parts lists, airflow diagrams.

27 BRONZE BEARINGS—*Bound Brook Oil-less Bearing Co, Bound Brook, NJ.* 19-page illustrated Compo Stock List No. 4 lists more than 600 most widely used sizes of oil-retaining porous flange, sleeve, and thrust bearings, together with cored and solid bar stock. Data on application, installation, lubrication, machining.

28 THREADED FASTENERS — *Standard Pressed Steel Co, Jenkintown, Pa.* 32-page catalog, Unbrako Standards, contains illustrated information on socket screw products, square head setscrews, Dryseal thread pressure plugs, precision ground dowel pins, and socket screw keys. Special features, applications, dimensions included.

29 GEAR SETS — *Michigan Tool Co, Cone-Drive Gears Div, Detroit 12.* 16-page bulletin 700 contains selection and ordering information, worm dimensions, gear and spider standards, tool charts, and hp ratings.

30 ALUMINUM DESIGNATION CHART—*Peter A Frasse & Co, New York 13.* Describes new system developed by The Aluminum Association. Includes both old and new designations for easy conversion; describes in detail the workings of the four digit index system.

31 CAM CLUTCHES—*Morse Chain Co, Detroit 16.* 8-page catalog C11-54 A gives general information, operating functions, line drawings illustrating the Morse cam principle, design features, and ordering information. Four additional illustrated catalog sheets, attached, list specifications, installation, and lubrication data.

32 LOW-ALLOY STEELS—*International Nickel Co, New York 5.* 16-page bulletin A-61 describes high-strength group; characteristics, corrosion resistance, how formed and worked, design factors involved in their use.

33 ROLLER GEAR DRIVES—*Ferguson Machine & Tool Co, Roller Gear Div, St Louis 31, Mo.* 20-page catalog 105 describes line for high-speed indexing of automatic production machinery. Tables on load ratings and dimensions for components only and housed units, data and instructions for calculation of loads, designing an installation, and selection of a drive.

34 AIR-BREAK STARTERS — *Electric Controller & Mfg Co, Cleveland 4.* Folder 1060 describes line of electric starters for 2200-5000-v motors. Illustrates units using the EC&M type ZHA 50,000 kva air-break contactor. Sectional and complete view of each type described.

MISCELLANEOUS

35 PRECISION PARTS—*Rockford Die & Tool Works, Rockford, Ill.* 4-page illustrated brochure and facilities list illustrates intricate parts made.

36 REBUILT MACHINE TOOLS — *Miles Machinery Co, Saginaw, Mich.* 37-page catalog 199 illustrates and describes wide range of units from automatics to welders. Facilities for reconditioning and modernizing available.

How to produce more at less cost ...increase profits!

Alemite methods of transferring lubricant to bucket pumps proved 63% faster by actual on-the-job time study!

An important saving in transferring lubricant—but even more important than the man-hours saved are the *machine*-hours saved—the costly repairs that don't have to be made, the increased bearing life. And the reason for these savings is that only "refinery clean" lubricants reach bearings—machines operate at peak efficiency longer—unit costs go *down!*

Alemite transfer pumps fit directly into refinery drums, fill a portable bucket pump in *less than a minute* with no air pockets, no spillage, mess or waste. Then, the large capacity of the bucket pump allows servicing of hundreds of bearings without stopping for refilling.

There is an Alemite transfer pump and bucket pump combination just right for your plant, big or small. Transfer pumps are available for 100 and 400 pound drums, all types of lubricant. And you will find a bucket pump to service any machine—to handle lubricants from the lightest oils to heaviest, high pressure greases. Wide range of capacities, developing pressures as high as 15,000 psi. All of them are tightly sealed—preventing contamination, reducing fire hazards.

With Alemite Plan "B" Only Refinery Clean Lubricant Reaches Machines

A 400 pound barrel of lubricant arrives at the plant oil room—sealed, fresh, "refinery clean."

An Alemite transfer pump is inserted in the bung-hole. It is threaded to fit and seal standard refinery bungs.

In less than a minute a twenty-five pound capacity bucket pump is filled with lubricant—free of contamination—no air pockets—no mess!

Now the bucket pump is ready to service hundreds of bearings without refilling—supplying lubricant that has been protected all the way from barrel to bearing!

This combination of transfer pumps and bucket pumps is known as Alemite Plan "B." It is one of the five Alemite plans that your trained Alemite representative can show you. Ask him about the colorful, new, informative slide film, "No Margin for Error," which will help you and your men cut production costs. No obligation, of course.

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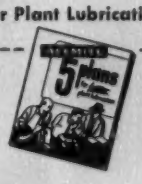

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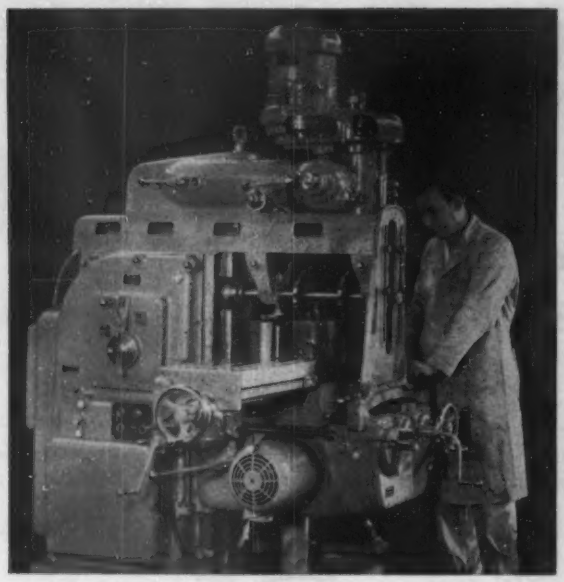
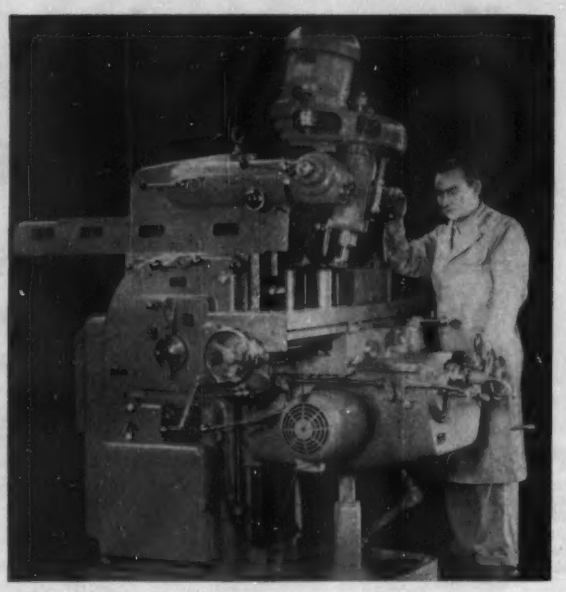


RECEPTOR RAM, in place of conventional overarm, takes standard arbor support and support brace for slab or straddle milling



ANGULAR MILLING is done by moving head and ram assembly forward while Receptor Ram remains in rear position

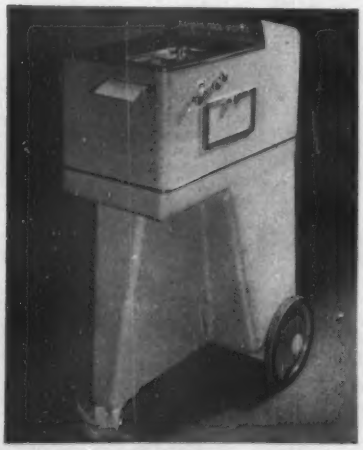
Gorton Milling Machine Incorporates Receptor Ram

New machine is basically a heavy-duty No. 2 or medium-duty No. 3 horizontal mill with Receptor Ram in place of conventional overarm. Two types of milling operations are performed as illustrated. For face milling, the arbor supports and brace are removed together with the arbor, then the Receptor Ram is moved to the rear until its front end is flush with the column face. Rigidity is provided by the full-width knee with bearing surface 24½ in. wide.

The horizontal spindle has a speed range from 25 to 2000 rpm. By attaching a heavy-duty vertical unit on the machine parking bracket, roughing cuts can be taken within the same speed range. For finishing, vertical attachment is swung aside and universal head and ram assembly, with speeds to 5600 rpm, is moved into position. The universal head, positioned through worm and worm gear, can be swiveled left, right, front, and back respectively: 45°, 45°, 45°, and 30°. The spindle has vertical feed of 3½ in.

Model 3-34 (not illustrated) equipped with plain vertical head and ram assembly, allows spindle speeds to 400 rpm. Then, in addition to hand lever and micrometer crank feed, power feed can be furnished. Also, end measuring rods and dial indicators can be installed for jig boring. Finally, tracer head and duplicator table are available. These can also be installed on machine with universal head.

George Gorton Machine Co, 1321-B Racine St, Racine, Wis

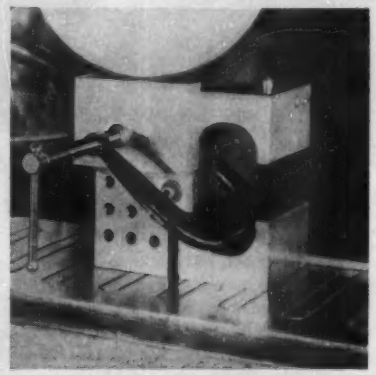


Universal Electrical Recorder

Electrical recorder produces permanent record and provides automatic process which minimizes chance for human error. Designed to equip analytical measuring machines and hob and worm lead machines, the unit is termed 1603 Electrical Recorder. All frequently used controls such as calibration, pen position, and line on-off switch are located in top control panel. Ink container, pen and ink starter and chart are accessible by sliding back top lucite cover positioned over graphs.

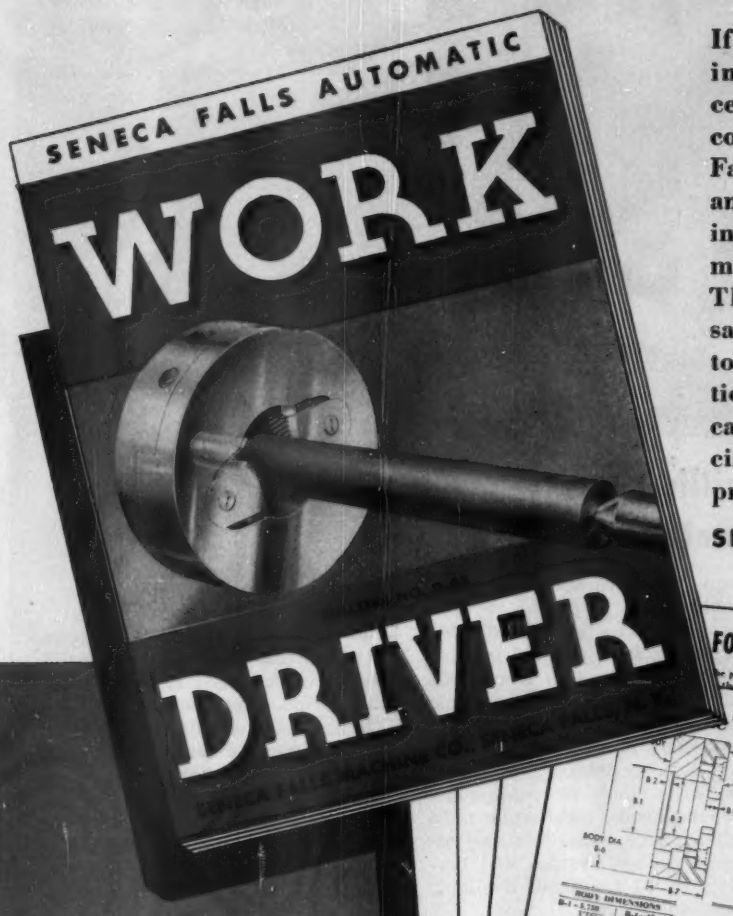
Instead of usual red pilot light, indirect lighting was placed under lucite cover. This not only indicates recorder in operation, but serves to illuminate chart. Feature of the overall design is unique three-point pivotal base with cutout to allow operator to stand close to the machine during operations. To reduce vibrations transmitted through floor, the rubber wheel is mounted at each pivotal point.

Illinois Tool Works, Chicago



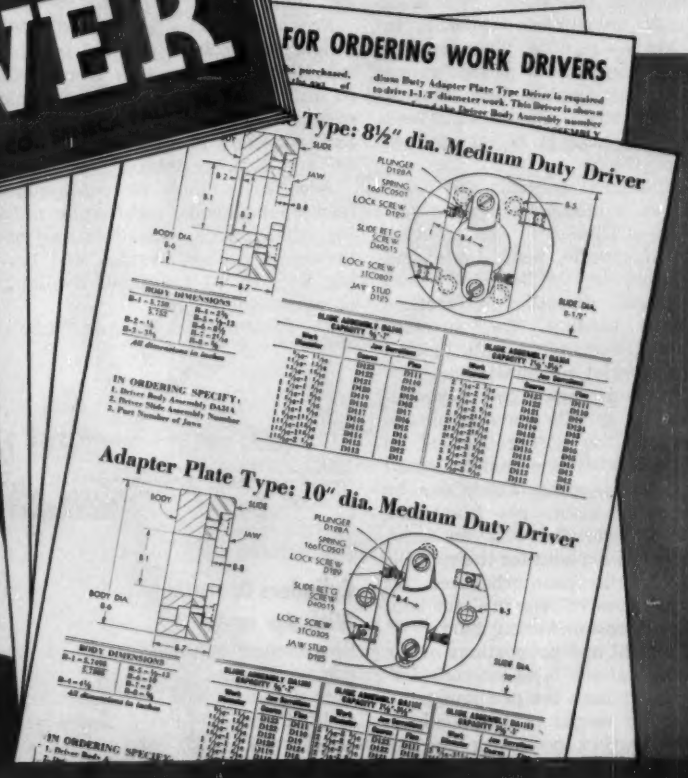
ANGLE PLATE has built-in recess in which C-clamp can fit while one side is being ground. Unit is then turned over on side to grind other side of work. Working surfaces are within 0.0002-in. squareness — *Federal Machine Tool Co, Bristol, Conn*

This catalog will help you
SPEED UP BETWEEN-CENTERS WORK



If your manufacturing operations involve turning work between centers, write for your copy of this comprehensive catalog of Seneca Falls Work Drivers. It illustrates and provides complete engineering data on eighteen *standardized* models now available from stock. These proven time and labor-savers no longer need be made to individual customer's specifications. You will find a standard unit cataloged that will meet your specific requirements and help speed production.

SENECA FALLS MACHINE CO.
Seneca Falls, N. Y.



TYPICAL PAGES FROM OUR WORK DRIVER BULLETIN

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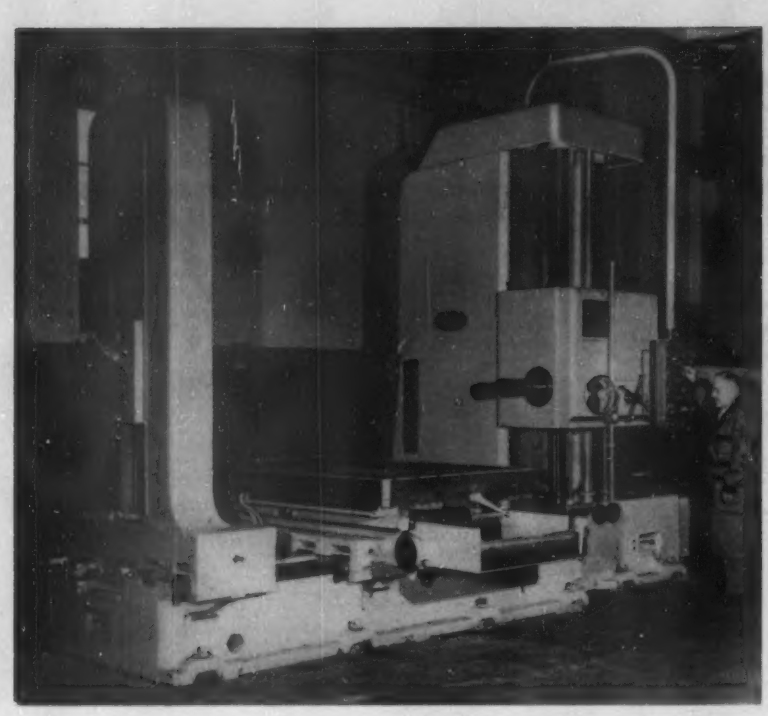
LATHE NEWS *from* SENECA FALLS



Boring, Milling, and Drilling on New Bullard Line of Horizontals

A completely new design is incorporated in the Model 75 line of table-type machines available in three sizes — spindle diameters of 3, 4, and 5 in. — with a wide range of head post heights, bed lengths, and table sizes. Continuous feed stroke of spindle is 28, 42, and 42 in., respectively.

All functional controls are operated from a movable pendant station — directional feed and traverse control of spindle, head, table, and saddle; selection of feed and speed rates, spindle direction of rotation, and head binders. The operator actuates directional levers instead of conventional pushbuttons.

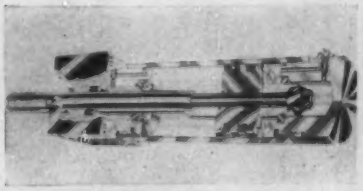
Screw and rack feed arrangement for the spindle provides smooth power feed for boring as well as sensitive hand-feed action for small drilling and tapping. Feeds can be set in either inches per revolution or per minute. There is an automatic depth knockout for the spindle, and hydraulic counterbalance for head and massive rear post for supporting extension boring bars.

The weight and proportions of the new headpost and head are considerably greater than the previous model. The full height of the headpost is a box section, providing less deflection at highest position. Another standard feature is the optical measuring device provided for head and table.

Feeds for table and head (16) range from 0.00065 to 0.125 ipr; for spindle and saddle (16) from 0.625 to 0.120 ipm. There are 36 spindle speeds ranging from 9.5 to 2032 rpm (3-in. model) or 5.83 to 1209 rpm (4- and 5-in. models).

Accessories such as continuous-feed facing heads, right-angle milling attachments, thread-cutting attachment, coolant system, and boring bars of all types are available as extra equipment.

The Bullard Co, Bridgeport, Conn

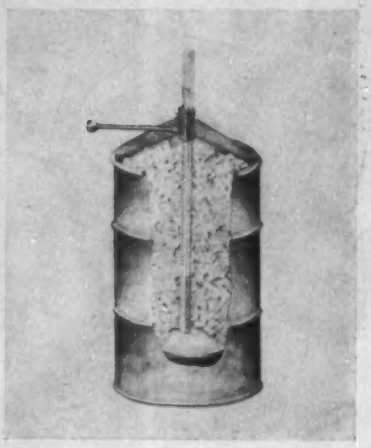


Cylinders Operate With Air or Oil

Spacemaker cylinders are made for use with either air or oil. Compactness results from elimination of tie-rods. Cylinders are designed with solid steel heads and heavy-wall seamless steel body, chrome plated.

Features include: hard chrome-plated cylinder walls and piston rods; piston rod scrapers; chevron self-aligning rod packing; extra-wide piston of one piece construction; and U-cup sealing and adjusting piston packings to provide maximum seal with minimum friction. Units are available for maximum of 200 psi air or 750 psi oil. Six standard styles of mountings are offered with bores from 1 through 4 in. and strokes from 1 through 12 in. in even increments of 1 in.

Tomkins-Johnson Co, Jackson, Mich



Device Raises Parts In Storage Drum

Drumvator is an inexpensive device for raising parts in storage drums to efficient work height. It can be used in any press or machine station since it is contained within parts drum. Does not require additional hoists, conveyors, or attachments.

The unit consists of two separate assemblies—hoisting frame and the stem and platform assembly. Stem and platform assembly is dropped into drum which will receive parts. Machine operator can fill drum above the platform with processed parts with or without hoisting frame in place. Frame can be quickly slipped over stem to be in position to raise parts to convenient level for subsequent operations. Operation of device is accomplished by moving hand lever on the hoisting frame—action raises stem and platform assembly.

Standard unit has 2000-lb lifting capacity. It may be necessary to provide thin sheet metal liner to prevent some parts from jamming in ribbed style drums. Clearance for 22-gage liner has been allowed on diameter of platform—standard dia is approximately 22¼ in. and fits a standard 55-gal. drum.

Acron Engineering Co, 11934 Lorain Ave, Cleveland 11

More than 2000 INDUSTRIAL PLANTS . . .

. . . ARE SAVING MONEY AND UPPING EFFICIENCY WITH

SBS 30

WATERLESS SKIN CLEANSER

You'd recognize many of them "right off the bat"—leading industrial plants that have tested, proved, ordered *and reordered* increasing quantities of SBS-30 Waterless Skin Cleanser.

Today, as you read this, more than 2000 plants are saving workers productive time . . . licking seemingly impossible skin cleansing problems . . . and vastly improving employee relations through the magic of SBS-30 Waterless Skin Cleanser.

The use of SBS-30 in our new Waterless Washstations provides cleansing facilities that require no plumbing . . . use no water . . . are 100% portable . . . actually *"bring the washroom to the worker"* . . . and lick almost every conceivable skin cleansing problem existing in industry! You owe yourself the facts . . . mail the coupon below for completely descriptive literature.

SBS—"The Washword of Industry"

SUGAR BEET PRODUCTS CO. · SAGINAW, MICHIGAN
CHEMICAL BY-PRODUCTS DIVISION

Sugar Beet Products Company, Saginaw 22, Michigan
Rush literature on SBS-30 Waterless Skin Cleanser and Washstations

Name_____
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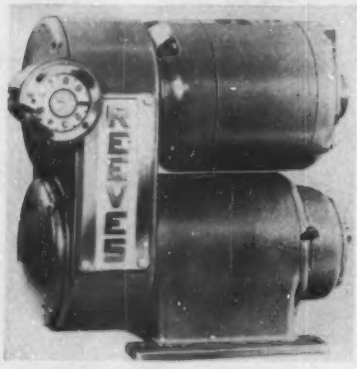
SECTIONIZED AUTOMATION is introduced on 350-ft Transfer-matic which performs 555 operations on V-8 cylinder blocks. 100 parts per hour have these operations performed: drilling, chamfering, tapping, camshaft boring, and milling. Machine is divided into five sections, any one of which can be shut down while others remain in automatic operation. (See page 189). Seven control-unit Toolometers program operations of tools. Machines incorporate: interchangeability of parts; JIC construction; manifolded hydraulic valves and limit switches; hardened and ground ways; automatic lubrication; and quick removal of block from each station — *The Cross Company, Detroit, Mich*



Redesign of Reeves Variable Speed Drive

Reeves announces redesign of fractional horsepower vari-speed motor drive—unit is now available in ¼, 1/3, ½, and ¾-hp sizes, and speed ranges from 2:1 to 10:1. New design has resulted in more compact unit available in 112 different assemblies, not only in horizontal and vertical models, but also 45° models and with vertical down output shaft. Speeds from 3 to 4660 rpm are available.

Another feature of the new design is a threaded spiral groove lubrication system said to assure complete coverage of lubricant over all sliding surfaces. In case of excessive lubrication an overflow outlet carries excess lubricant away.

Additional information is in manufacturer's Bulletin M-543.

Reeves Pulley Co, Columbus, Ind

Continuous Thickness Gaging By Non-Contacting Gage

X-ray thickness gage, designed for gaging aluminum foil as thin as 0.0003 in. and steel as thick as 0.075 in. with accuracies of 1%, utilizes a split X-ray beam directing part of beam through wedge-shaped disk, having variation in thickness equal to range of gage, while remainder of beam penetrates material being gaged.

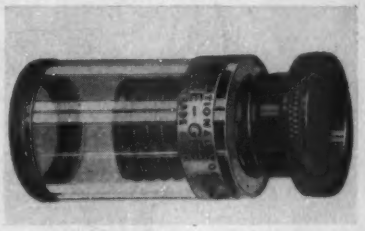
As strip progresses through mill, difference of thickness between wedge and gage material causes electrical balance system to equalize them by revolving wedge and thus show a meter reading equivalent to thickness change.

Designed to read deviation in decimal thickness, gage can be furnished with dual range or three ranges. A recorder may be placed in circuit to give direct reading of absolute thickness of material. Dual range may be provided on this direct-reading recorder.

Pass line may vary anywhere in air gap from top head to bottom head without any change in reading. It is necessary, however, that pass line be maintained perpendicular to X-ray beam.

Gage will handle strip material in varying ranges to approximately 0.075 in. There is no appreciable effect on gage operation due to fluctuations in voltage or frequency.

Pratt & Whitney, Div Niles-Bement-Pond Co, West Hartford 1, Conn



Pocket Comparator

Pee Gee pocket comparator accomplishes its measurements through the use of a magnifying lens (6 power) and transparent reticles which are accurate reductions of large master layouts. The device can be used for checking radii, angles, chamfers, threads, small holes, lineal, radial, and tangent dimensions, and odd shapes on machined, stamped, or cast production parts.

Reticle No. 103 which comes in the instrument is used to measure dimensions from 0.0025 to 0.5 in. in steps of 0.0025 and also 0 to 0.10 mm in steps of 0.2 mm. Body of the comparator is of clear molded lucite ⅛ in. thick. Adjustable lens barrel and reticle retainer ring are of machined aluminum with black anodized finish. Unit is focused by sliding eyepiece in or out of lucite body. Fine adjustment is accomplished through built-in screw arrangement.

Comparator with reticle 103 is $9.75. Six reticles cost $4.25.

National Tool Co, 11800 Madison Ave, Cleveland 2, Ohio

SNYDER SPECIAL 21-STATION AUTOMATIC LINE

TRANSFER MILLS, DRILLS, CORE-DRILLS, REAMS AND TAPS INTAKE MANIFOLDS; TESTS MANIFOLD FOR AIR LEAKAGE AND VOLUMETRIC AIR FLOW, INSPECTS PROCESSING PROGRESSIVELY, MARKS REJECTS; INSERTS HEATER TUBES; PROCESSES 130 UNITS AN HOUR AT 80% EFFICIENCY.

SNYDER

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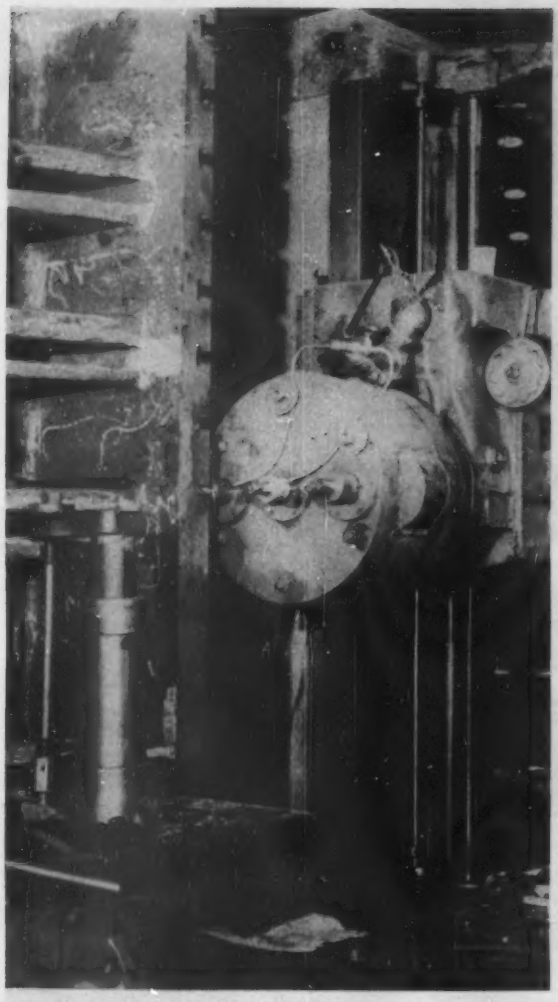
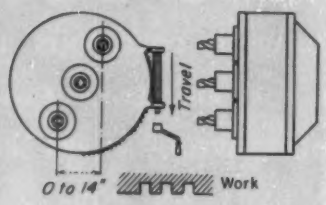
3400 E. Lafayette, Detroit 7, Michigan
29 Years of Successful Cooperation with Leading American Industries



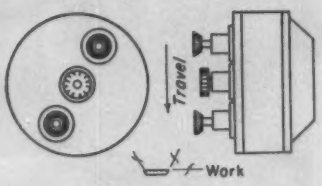
ONE PASS MILLING FOR "T"-SLOTS

THREE-SPINDLE IN-LINE MILLING of a cast iron slide for a hydraulic press. Milling head is mounted in spindle of a No. 5 Giddings & Lewis boring mill. Spindle speed 110 rpm; feed 2 ipm; length of slot 72 in. Lead cutter is 15/16 in. dia—depth ⅞ in.; intermediate cutter is 1-1/16 in. dia—depth 2-1/16 in.; trailing cutter, conventional "T"-slot cutter

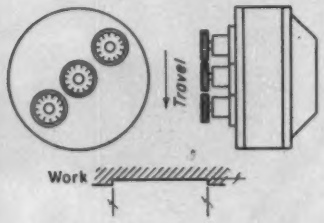
VERSATILITY OF SETUPS



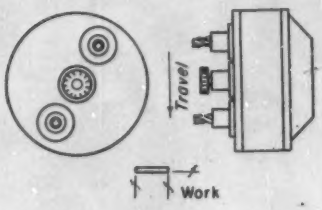
(A) MULTIPLE KEY SLOT MILLING. Maximum center distance between outside spindles is 14 in., while maximum center distance between slots when using three spindles is 7 in. Milling head is adustable for center spacing between 0 to 14 in. When milling large keyways, size of keyway can be held without size grinding cutters by rotating head until desired width is obtained



(B) DOVETAIL MILLING. A 6-in.-dia, 10-tooth inserted cutter, ganged with a pair of 2½-in.-dia, 12-tooth dovetail cutters, completed a 4-ft workpiece to a depth of 1 in. in 14.5 min



(C) WIDE FACE MILLING. Three 6-in.-dia inserted tooth cutters running at 60 sfpm and feed of 0.010 ipt, cut an 18-in.-wide groove 0.250 in. deep, removing 17.2 cu. in. of material



(D) MILLING EDGES AND TOP SURFACES OF WORK. Inserted tooth cutter and two 3-in.-dia spiral cutters, milling at 0.250-in. depth, with feed of 1.528 ipm, completed 1 x 5-in. workpiece in four passes

Three Spindle Universal Rock Milling Head Does Multiple Machining Operations

Three-spindle "Rock" milling head, Model 501, is fully adjustable from maximum center distance to straight-line operation without removing head from machine. It has direct ratio to spindle of machine, and accommodates cutters from ⅜ to 1¼-in.-dia, as well as adaptors for face-milling cutters.

Unit comes complete with Chico Grip standard size collets. Head can be mounted in either a vertical or horizontal position. Preloaded Timken precision roller bearings in spindle assembly eliminate end thrust and assure runout to 0.0005 in. TIR.

Results from actual production runs show cutter life doubled compared to one-spindle methods.

It is recommended that Model 501 head be used on machines similar in size or larger than No. 5 G&L openside milling machine. At additional cost, worm and worm gear is furnished for easier rotation of head. Heads with different spindle center distances, or special design, furnished on request.

Shipping weight is approximately 700 lb. Price is $3200 FOB, Strasburg.

Rockenfelder Industries, Strasburg, Ohio

Suntac Cuts Hydraulic Leakage 90%

Hydraulic ram for injection molding press leaked excessively, using ordinary hydraulic oil. Make-up ran approximately 8 gallons per week.

Leaking oil dripped on hot platen and splashed onto operator, causing burns, spotted clothing, and generally untidy condition around the press.

Packings required changing at least once a month—frequent adjusting. Down time for maintenance seriously reduced productivity.

Changed to SUNTAC. Make-up oil now running only about ½ gallon per week. Operators are happier, and productivity greatly increased.

If you have a leaky hydraulic system, remember this: SUNTAC is the hydraulic oil especially compounded to reduce leakage. Special additives make the droplets cling together . . . keep them from leaking through packings. Experience has proved that SUNTAC will cut leakage an average of 35%. Get complete information about SUNTAC Hydraulic Oil from your Sun Oil Co. representative. Or write Dept. AM-12.

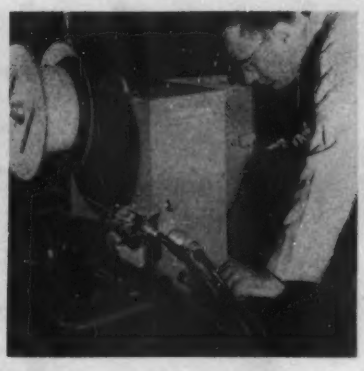
INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO®

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline



Westinghouse Engineers Develop Improved Arc Welding Process

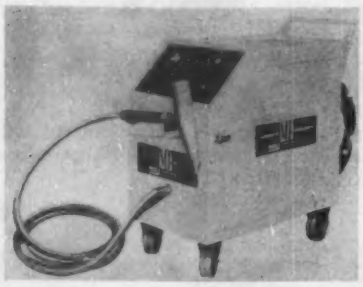
Higher welding speeds, better quality welds, and lower operating costs are said to be the principal benefits of a new consumable-electrode, inert-gas, arc welding process. The field tests reportedly show this new process to have a 15 to 20% faster welding speed at a 25 to 50% lower cost than other manual and semi-automatic inert-gas methods.

The key to the process is a coated wire, product of five years of research. Its greatest benefits are derived when used with the newly designed welding gun, welding feed-wire control, and dc arc welder.

Mild steel—with or without normal mill scale—of thicknesses from 1/16 inch up can be fillet, lap, or butt welded. The system can be used as a semi-automatic or automatic process. Primarily intended for horizontal and flat position welding, it is not yet developed for vertical or overhead.

Mild steel wire of special analysis is coated with materials that stabilize the arc, eliminate spatter, and assure good penetration at the higher burn-off rates possible with straight polarity. System uses one-third less shielding gas than similar welding processes, states Westinghouse; also that the design of the electrode gun was approached from the operator's point of view. The result is a light weight, well-balanced gun rated at 500 amp. Feed control for the welding wire is positive. The rate at which the wire is fed is constant regardless of load; electrode length beyond the tip of the gun is such that losses due to trimming are eliminated.

Westinghouse Electric Corp, Arc Welding Dept, Buffalo, NY



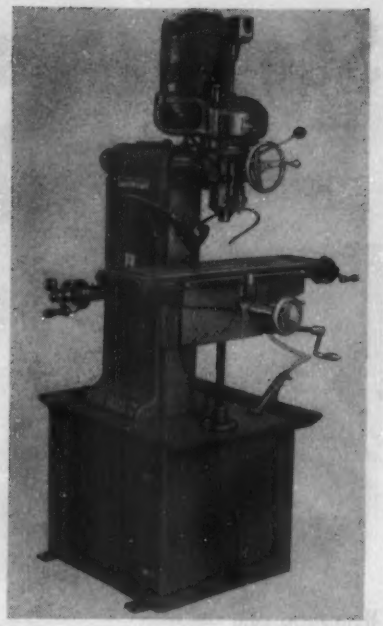
Welder Regulates Arc and Wire Feed Automatically

Welding machine feeds bare wire through hand-held hopper containing magnetic flux. Electrode wire fed continuously from coil reaches arc with flux covering. Operator can weld steadily for 15 min if desired.

Unit is connected to conventional ac or dc welding machine and operates over current range from 150 to 500 amps. It consists of hook-up cables, small chassis mounting an electrode wire reel, motor-driven feed rolls, flexible 14-ft tube through which electrode wire feeds to hand-held hopper. Magnetic flux provides arc shielding, deoxidation, arc stabilization, slag coverage, and in some instances, alloying ingredients.

Use of magnetic flux and the magnetic gate on the hopper nozzle is reported to be a revolutionary advance. Gate consists of tiny permanent magnets in walls of nozzle orifice. When machine is not welding, flux clings to magnets in tufts and blocks the annular opening around electrode wire. When welding starts, magnetic field is strong enough to drag flux along with wire as it leaves gate. Amount of flux is influenced by density and granule size, both of which can be controlled.

American Brake Shoe Co, 230 Park Ave, New York 17



Vertical Milling Machine Has Production Attachment

Model VM-1 is designed to perform form milling, drilling, and boring operations. It combines precision-built attachments and hand-scraped bearing surfaces. It is available with the Bridgeport model M attachment, the Crowningshield, or without any vertical head.

The Crowningshield has its ground spindle mounted in Timken precision tapered roller bearings and is available with a variety of bores. Six-step V-pulleys give spindle speeds from 330 to 3000 rpm. Belt guard can be raised for ease of belt changing. A ½-hp motor is incorporated with reversing switch wired for any standard voltage.

The machine has heavy-walled castings with wide ways. Large table is supported by saddle-bearing surface of 117 sq in. Additional lateral support is mounted inside the base. Nearly a foot of heavy-walled column surrounds the 3-in. overarm.

Crowningshield-Harris Co, Greenfield, Mass

Self-stick labels are available in roll form, with no backing paper to pull off. Back is coated with plastic gum able to withstand all cycles of temperature changes, as well as oil and grease. Can take pen, pencil, or typing, or can be printed to order. Time Tape is a continuous tape from ¾ to 2 in. wide; Time Labels are white with red border from ¾ x 1 to 2 x 3 in. in roll form.

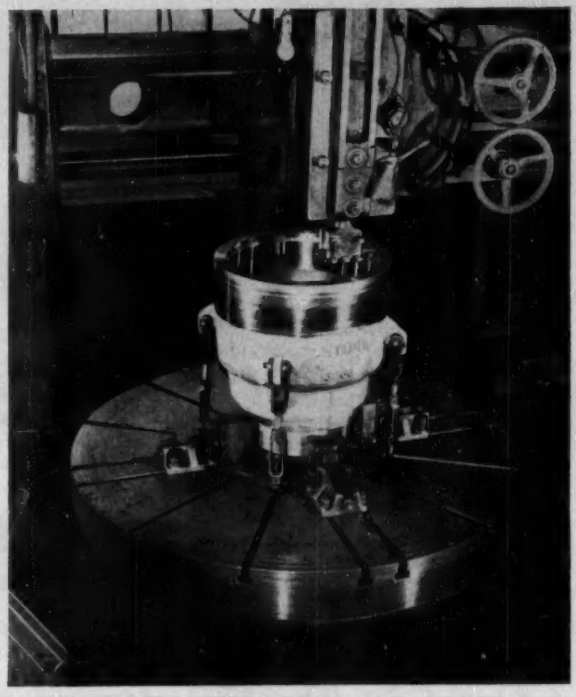
Professional Tape Co, Box 41, Riverside, Ill

The Engineer's Report

CASE HISTORY
LUBRICANT Calol Vistac Oil
FIRM Hydril Co., Los Angeles, Calif.

Tacky oil eliminates loss of heavy-duty bearings!

IN 8 YEARS OF USING CALOL VISTAC OIL, the Hydril Co., Los Angeles, has not lost a single bearing in any of the 31 pieces of heavy-duty machining equipment in its plant (below). Calol Vistac Oil is used in bearings in the plant, ranging in size from ½" up to the 36" plain bearing that carries the six-ton table on the 84-inch boring mill at right. They report it keeps a lubricating film on bearings under extreme loads, saves the cost of down-time, parts, and labor formerly involved when bearings went out.



USED ON WAYS OF ENGINE LATHES in the plant, Calol Vistac Oil stays in place overnight and week-ends. It eliminates the trouble caused when previous oil drained off these precision surfaces, allowing grit to get into pores of the metal. They also use Calol Vistac Oil in all gear trains except worm drives. It comes in several grades to meet a wide range of operating conditions.

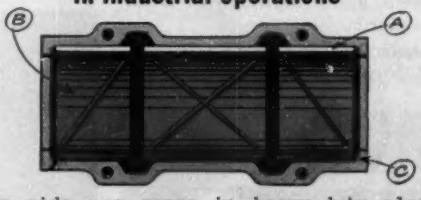
FREE CATALOG: "How to Save Money on Equipment Operation," will be sent on request to Standard Oil Company of California, 225 Bush Street, San Francisco.

FOR MORE INFORMATION about petroleum products of any kind, or the name of your distributor, write or call any of the companies listed below.

CALOL

TRADEMARK "CALOL VISTAC" REG. U. S. PAT. OFF

How CALOL VISTAC Oil cuts costs in industrial operations



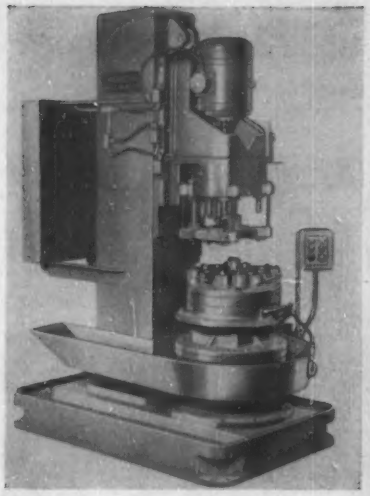
Has wide use range in heavy-duty plain bearings operating in hard service, air cylinders, reduction gears, motor gearheads, etc.; excellent air-tool lubricant—atomizes quickly and stays fluid at low temperatures.

A. Additives help form oily, pressure-resistant film...sticks on slow-moving parts and resists high temperatures.
B. Economical—small quantity will lubricate efficiently, dissipate heat.
C. Tenacious film cuts power loss and wear.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas



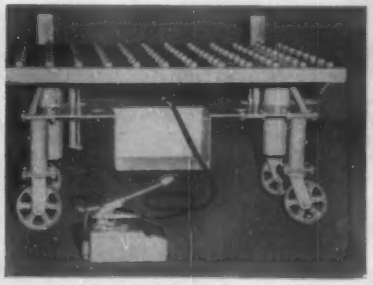
Hydraulic Feed Machine Handles Small Lots

Way-type hydraulic feed machine, Hydro 3, was designed to handle small run production. It has a cast iron base with built-in coolant tank, chip trough, and cleanout. Welded steel column has hardened and ground ways. Width of ways is 7½ in.

Stroke of the machine is 10 in.; feed thrust is 3100 lb. Motor mounting brackets mount 7½-hp, 1200-rpm motors. Index tables have built-in safety features and are driven by fluid-drive motor. There are three sizes, 20, 30 and 42 in., and can be bored for any number of stations ranging from 2 to 15.

Standard cycle is rapid advance feed, positive stop, and rapid return. Such features as second feed, jump feed and dwell can be added. Hydraulic installation is Vickers throughout and complies with latest JIC standards.

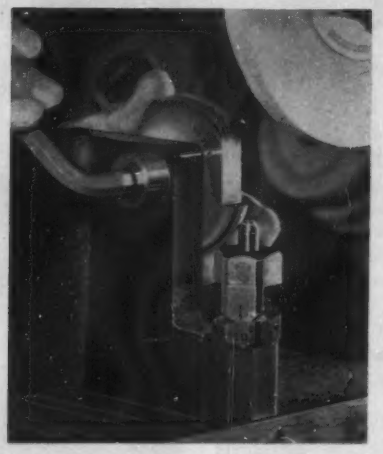
Michigan Drill Head Co, Hazel Park, Detroit, Mich



Heavy Plate Positioner Has Ball Transfer Top

Adaptation of standard sheet-feeding table. Ball transfers, set into table top on 6-in. centers, allow one man to position plates measuring 48 x 72 in. and weighing up to 2000 lb. Top is adjustable from 36 in. in lowered position to 48 in. in elevated position. Hydraulic rams are operated by foot pump.

The Raymond Corp, 328-127 Madison St, Greene, NY

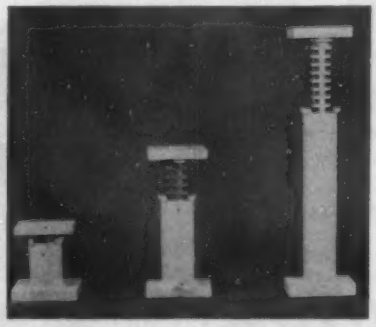


Circular Form Tool Grinding Fixture

Acorn grinding fixture requires no calculations to operate. Relationship between cutting face and centerline of tool, as well as same degree of hook, are maintained at all times. It adapts to any make of surface grinding machine with or without magnetic chucks, can be used to grind with periphery or side of grinding wheel.

Each is supplied with proper stud and thread for any type of machine. Additional studs and gages can be had for a slight additional cost.

Pablo Industries, Inc, 6943 West Grand Ave, Chicago 35, Ill



Clamp Posts

Clamp posts are for use with hold-down clamps. They are said to reduce machine setup time for range of milling, boring, planing and drilling operations. They are the latest addition to a line of accessories which includes chuck jaws, raising blocks, and leveling wedges. Units are produced in 4, 7, and 12-in. standard sizes, adjustable to heights of 7, 12 and 22 in.

Ingersoll Milling Machine Co, Rockford, Ill

Expandable Mandrel Driver Designed for Vertical Honing

Driver with three expandable mandrels is for vertical use in drill-presses for honing within range of 3 to 6 in. Each mandrel which bayonets into driver is available separately. Mandrels allow for 1-in. expansion, picking up ranges in 1/16 in. by a combination of shims and inserts. Sets of stones, ground to correct diameter, are available for each mandrel.

They can be used only with associated MD-4 Superior Mandrel driver which comes with 2, 3, or 4 Morse Taper.

Superior Hone Corp, 1607 Elreno St, Elkhart, Ind

Scherr Angular Measuring Chart For Optical Comparators

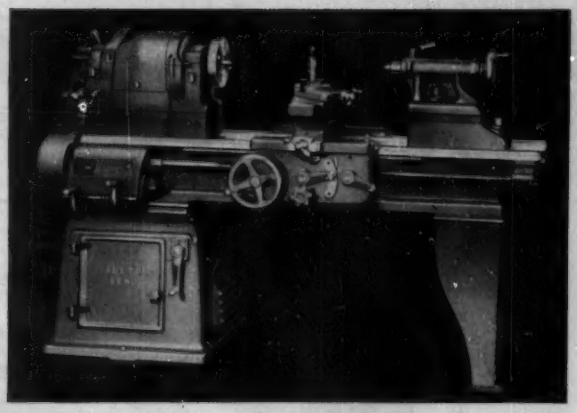
George Scherr announces development of angular measuring chart for use on optical comparators. Gage protractor chart will permit rapid and accurate measurements of all angles with vernier reading to 5 min. of arc. It is adaptable to all types of projectors not equipped with protractor screens or rotary tables. Chart is constructed of unbreakable satin-finish plastic.

George Scherr Optical Tools, Inc, 200 Lafayette St, New York 12, NY

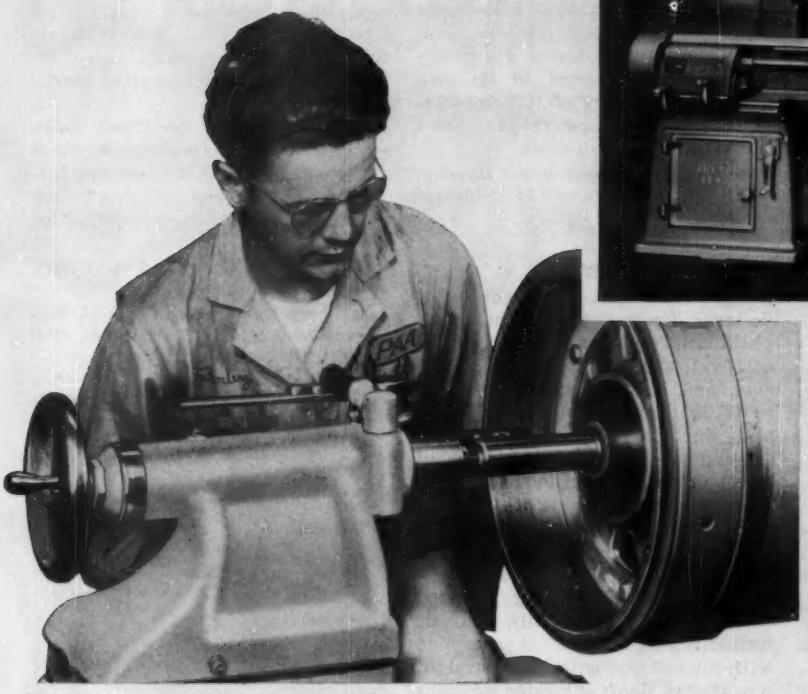
Hold-Down Clamp

Tee clamp head is slipped up through cross slots in table of drillpress; thumb screw adjusts bar parallel with table. From below table, clamp is tightened by turning knob counterclockwise.

Hunter Tool Co, 6608 S Gretna Ave, Whittier, Calif



16-24" x 6' Quick Change Gear Lathe



SOUTH BEND 16-24" LATHE

CAPACITY for Big Jobs! ACCURACY for Any Job!

Here's a lathe with a versatility that makes equipment dollars go further. Its 24" swing provides the capacity for handling a variety of large diameter, medium-weight jobs whose size would otherwise require large, heavy lathes. This extra capacity is achieved without any sacrifice of efficiency in the machining of smaller work.

Having an unusually wide range of spindle speeds, all sizes of work can be machined at effective cutting speeds. The improved South Bend two lever gear box permits instantaneous selection of power feeds for any turning, facing, or thread cutting operation. A complete line of chucks, tools and attachments simplifies tooling the lathe.

SPECIFICATIONS: Swing over bed and saddle wings—24⅜". **Collet Capacity**—1". **Spindle Speeds,** sixteen—11 to 710 r.p.m. **Longitudinal Feeds**—48 R.H. or L.H., .0015" to .0841". **Cross Feeds**—48 in or out, .0006" to .0312". **Thread Cutting**—48 Threads R.H. or L.H., 4 to 224 per inch.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941
1941
1954
WAGES UP 150%
MATERIALS UP 131%
PRICES UP 49%
Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

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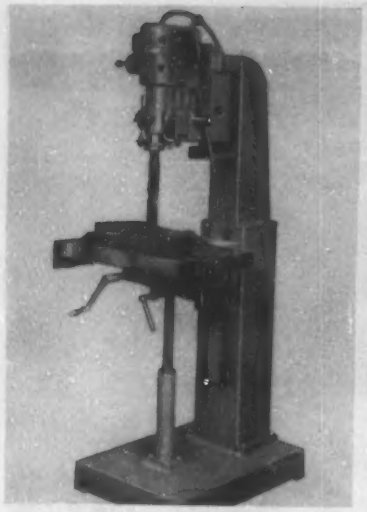


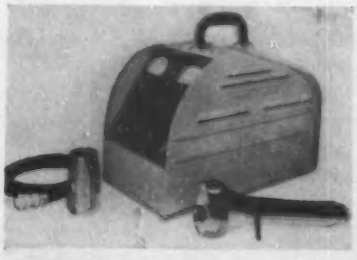
Box-Column Drill Has 30-in. Swing

Machine has drilling capacity up to 1½ in. in cast iron, 1¼ in. in mild steel. Incorporates completely geared drive providing eight spindle speeds from 125 to 150 rpm.

Drill has precision-ground table 15x24 in. with three T-slots on top and one side surface as well as V-groove at side. Table is supported on Acme elevating screw and guided on hardened and ground ways. Motor, spindle assembly, and table adjustment mechanism are of ball bearing construction throughout.

Combined spindle travel and vertical adjustment of head are 8½ in.; maximum distance of spindle to table is 28 in.; minimum distance 3½ in.; swing is 38 in. Spindle taper is No. 3 Morse.

I O Johansson Co, 7730 Austin Ave, Skokie, Ill



Portable Electronic Vibration Analyzer

Portable electronic vibration analyzer, Model 400, capable of balancing rotating parts at speeds up to 5000 rpm and of tracing any vibration up to 20,000 cpm, was designed to eliminate vibration in production machinery and to simplify maintenance of plant equipment through dynamic balance of rotating parts.

Instrument weighs only 24 lb. Balancing with aid of stroboscopic lamp with range up to 5000 flashes per min is done through four-step procedure. Part is balanced while running at design speed in its own bearings. Accuracy of 10% is maintained on all three ranges, 0.001, 0.01, and 0.1 in. full scale.

International Research and Development Corp, 168 E Hosack St, Columbus 7, Ohio

Tachometer Generator

Low-cost dc tachometer generator, designed for variety of control applications, provides voltage output of 50v/1000 rpm for speeds to 500 rpm, and 100v/1000 rpm for speed to 25,000 rpm. Industrial applications include measuring and controlling speed in manufacture of steel and aluminum, wire-forming machines, and machine tools.

Product is totally-enclosed, and can be either flange or foot-mounted to be direct-coupled, geared or belt-driven. Capable of being mounted horizontally or vertically, the dc tachometer generator is equipped with conduit box with ½-in. straight pipe thread. Shaft extension on unit's pulley end is 5/16 in. in dia and 15/16 in. long with flat section and stub shaft on opposite end.

General Electric Co, Schenectady 5, NY

Motor-Generator Control And Heating Station

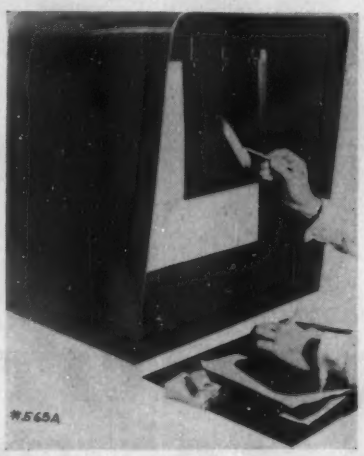
Set has been designed for forging, hardening, brazing, or annealing operations where deep penetration is desired. Motor-generator sets with frequency cycles of 960, 3000, or 9600 and power inputs ranging from 50 kw to 1250 kw, for use with the new station, are now available from Lindberg.

Output transformer can be installed through front or rear of station. Output transformer busses can be either vertically or horizontally oriented. Supervisory system of Checklites maintains watch on air temperature, water temp, high-v interlocks, and other operating conditions.

Operations may be timed automatically by four-circuit synchronous timer. Vernier adjustments are furnished on first three positions for accurate heat, quench, and capacitor contactor.

Various optional and auxiliary equipment is available.

Lindberg Engineering Co, High Frequency Div, 2444 W Hubbard St, Chicago 12, Ill



*565A

Mitchell Viewer Permits Spot Scanning and Full Study

High intensity viewer for interpreting industrial X-ray film helps eliminate operator error, speeds interpretation, and saves time by permitting spot scanning and study of any part of film as well as 14x17-ft illumination.

Viewer eliminates need for removing film to spot position for higher intensity illumination by providing a 250-watt flood lamp that can be moved horizontally and vertically in back of screen. Lamp provides 3-ft round spot of variable intensity and variable aperture in excess of 4.8 H&D.

Intensity of light sources is changed by remote-controlled voltage regulator mounted on tilted front panel. Masks will eliminate glare from open area of screen. Heat is kept away from film by fan mounted in base of unit. In addition, a ½-in. plastic cell filled with an aqueous solution separates the rear screen from frosted viewing screen.

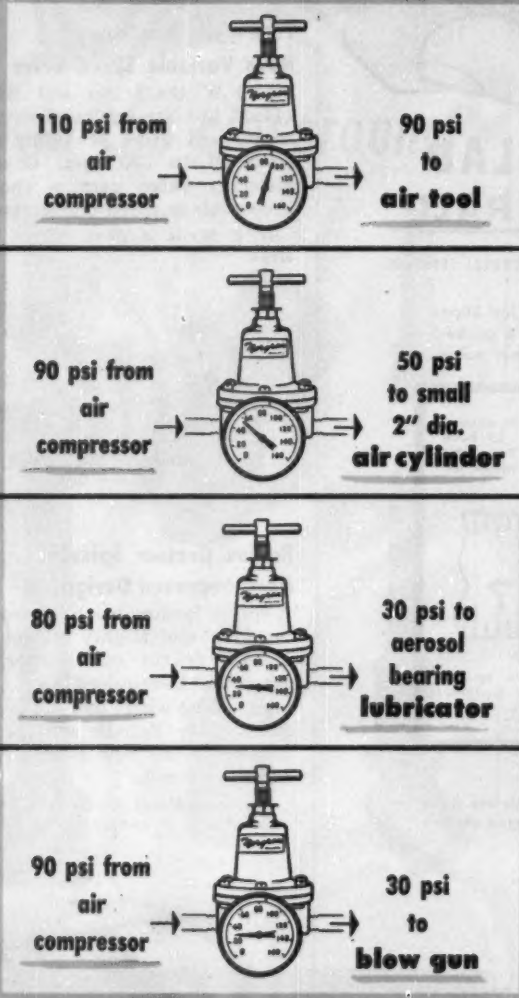
Mitchell Radiation Products Corp, 128 E Washington St, Norristown, Pa

4 ways to cut compressed air costs

with an investment of only $9.20*

*for a standard ⅛", ¼" or ⅜"

NORGREN PRESSURE REGULATOR with gauge


110 psi from air compressor
90 psi to air tool
90 psi from air compressor
50 psi to small 2" dia. air cylinder
80 psi from air compressor
30 psi to aerosol bearing lubricator
90 psi from air compressor
30 psi to blow gun

Don't use an Air Tool at 110 psi line pressure when 90 psi of air gives you top efficiency

Here a Norgren Pressure Regulator would save around 180,000 cubic feet of free air per year on one air tool used 50% of the time.

Don't use 90 psi air pressure on Clamping Cylinders, Air Chucks, etc. when 50 psi usually works as well

Normal use of a 2" dia. cylinder with a 2" stroke at Norgren-regulated 50 psi pressure would save about 7000 cubic feet of free air per cylinder per year.

Don't use line pressures of 80 psi for aerosol bearing lubrication when 30 psi does the job better

Recommended maximum pressure and flow are 30 psi and 2.8 cfm. A Norgren Regulator here could save approximately 450,000 cubic feet of free air per year per lubricator.

Don't use an Air Blow Gun at line pressure of 90 psi when 30 psi serves as well — and is safer

Here at the lower Norgren-regulated pressure of 30 psi you would save about 90,000 cubic feet of free air on one gun used an hour a day.

OTHER BIG ADVANTAGES of using the proper Norgren-regulated air pressures: 1 — less wear on your air equipment... 2 — money saved on maintenance costs.

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C. A. Norgren CO.
3436 So. Elati, Englewood, Colo

New . . .

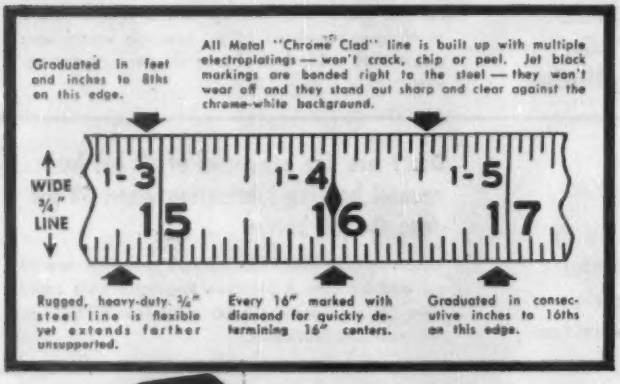
a heavy duty tape rule with a wide 3/4" line in CHROME CLAD . . .

It's the Finest Ever Made!

LUFKIN CHROME CLAD Super MEZURALL

IN 10 FT. (C9310) AND 12 FT. (C9312) LENGTHS

For extra-heavy industrial use, the new Lufkin Chrome Clad Super Mezurall can't be equalled by any other tape rule. It's packed with design and construction features that make it a super value.


Graduated in feet and inches to 8ths on this edge.
All Metal "Chrome Clad" line is built up with multiple electroplatings — won't crack, chip or peel. Jet black markings are bonded right to the steel — they won't wear off and they stand out sharp and clear against the chrome-white background.
WIDE 3/4" LINE
1-3
1-4
1-5
15
16
17
Rugged, heavy-duty 3/4" steel line is flexible yet extends farther unsupported.
Every 16" marked with diamond for quickly determining 16" centers.
Graduated in consecutive inches to 16ths on this edge.

EXTRA-LONG SELF-ADJUSTING END HOOK permits accurate hook-over or butt-end measurements.

SUPER MEZURALL ALSO AVAILABLE WITH "WHITE CLAD" BLADE

MAGIC METAL CASE

New alloy metal makes this the lightest, yet toughest and strongest die-cast case made.

PACKED IN FREE "SEE THRU" RE-USABLE BOX

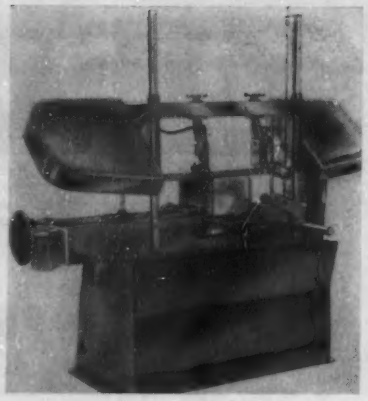
Each Chrome Clad tape rule comes in a beautiful 2-color plastic box with hinged cover and snap fastener.

BUY LUFKIN TAPES • RULES • PRECISION TOOLS FROM YOUR DISTRIBUTOR

337

THE LUFKIN RULE CO., SAGINAW, MICH.

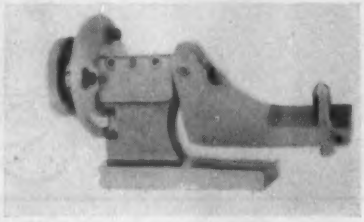
132-138 LAFAYETTE ST., NEW YORK CITY • BARRIE, ONT.



Two Wells Bandsaws Have Variable Speed Drive

Model W (9x18 in.) and Model F (14x18 in.) are equipped with variable speed drive providing speeds from 50 to 290 fpm. Graduated metering valve permits choice of proper blade speed and pressure.

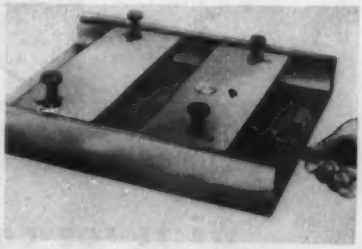
W F Wells & Sons, Three Rivers, Minn



Radius Dresser Spindles Have Improved Design

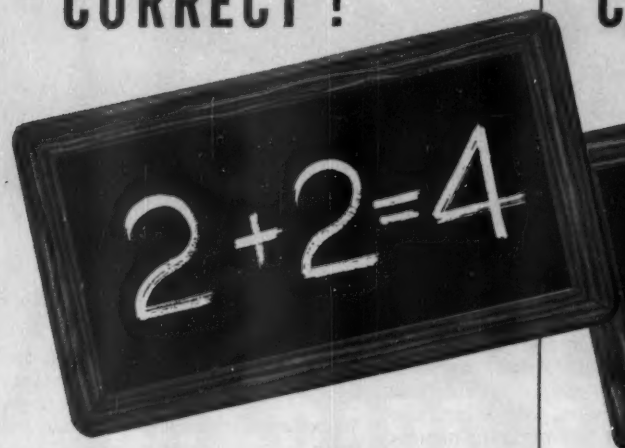
A spring loading has been developed for spindle of Mighty Midget radius dresser to cut out chatter. Less passes will be required to cut a radius on grinding wheel and diamond will last longer. Spindle will be incorporated in all new radius dressers at no extra cost.

Sperman Metal Specialties, 2199 East 21st Street, Brooklyn 29, NY



MOTOR BASE, quick slide, provides for releasing the adjusting screw which permits motor to be moved freely after base is bolted down — *T B Wood's Sons Co, Chambersburg, Pa*

CORRECT !



in the classroom!

CORRECT !

in the tool room!

If a $2.00 tool must be replaced every six months, tool costs on that job total $4.00 a year. If, on the other hand, a $3.00 tool will give a full year of service, you'll get $4.00 worth of tool service —and save $1.00 a year on tool costs as well.

In the very simplest terms, that's the reason why Apex tools are preferred for production nut running operations. Designed specifically for continuous, heavy-duty use. Apex tools cost a little more in the beginning, a lot less in the end.

Apex tools are precision-built of high carbon electric furnace alloy steel, cold broached and heat treated to withstand the severe shocks of impact service. That's the reason your tool costs will be lower when you ask for Apex nut running tools. Choose from more than 5,000 stock types and sizes of impact sockets, extensions, adapters, universal wrenches. If your requirements are special, send sketch or blueprint—we'll do our best to help you.

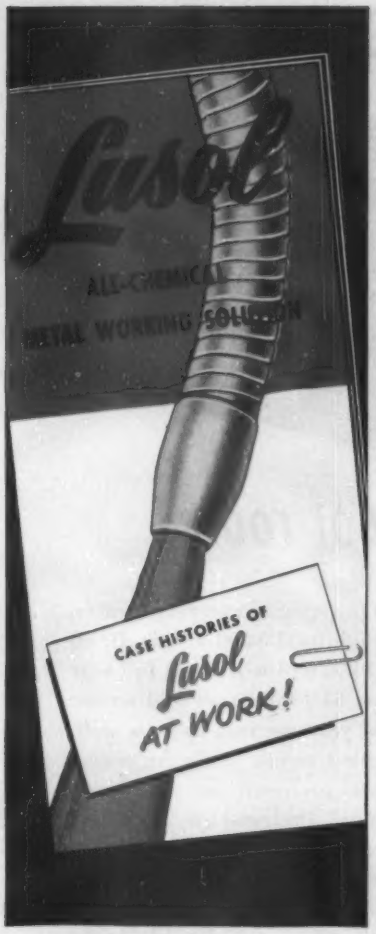
CATALOG 29—Specifications, drawings, illustrations of the complete Apex line of nut running tools. Write, on your company letterhead please, for your copy.

APEX TOOLS

impact sockets, extensions, adapters

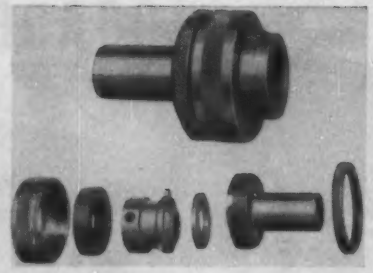
THE APEX MACHINE & TOOL COMPANY
1026 S. Patterson Blvd., Dayton 2, Ohio

POWER BITS, INSERT BITS AND BIT HOLDERS, FOR PHILLIPS, FREARSON (Reed & Prince), SLOTTED, CLUTCH HEAD and SOCKET HEAD SCREWS • HAND DRIVERS FOR PHILLIPS, FREARSON AND CLUTCH HEAD SCREWS • TWO-PIECE DRIVERS FOR HEX HEAD SCREWS • SOCKETS, EXTENSIONS, ADAPTERS AND NUT SETTERS • UNIVERSAL SOCKETS, EXTENSION WRENCHES AND ADAPTERS • AIRCRAFT AND INDUSTRIAL UNIVERSAL JOINTS • SELF-RELEASING AND ADJUSTABLE STUD SETTERS • SAFETY FRICTION TAPPING CHUCKS • VERTICAL FLOAT TAPPING CHUCKS.



This leaflet tells how Lusol works to the advantage of the machine operator *and* management

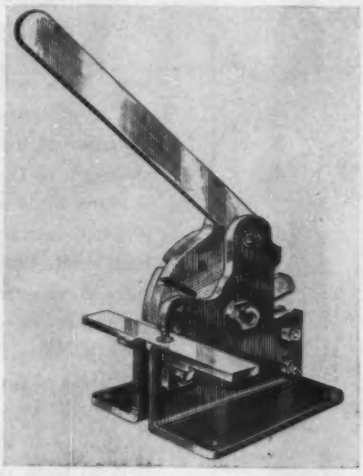
FOR A FREE COPY— MAIL THE COUPON on the opposite page



Reamer Holder

Full-floating reamer holder has pliable synthetic rubber float sleeve to compensate for angular and out-of-parallel misalignment. Chatter is eliminated by design which acts as cushioning device. Mounting also guards against tool-breaking shocks. Long-shang chucking reamers or short-shank screw machine reamers can be used without shortening shank or reamer part. Positive drive is through reamer head by U-shaped drive key. Tension of float sleeve can be changed.

Green Mfg Co, Rockton, Ill

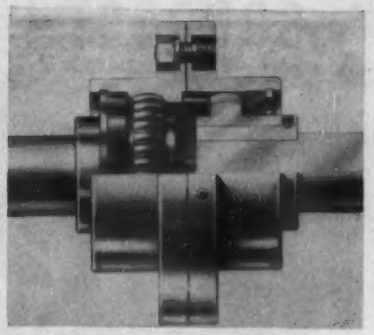


Four-Tool Unit

Compact unit punches, forms, shears, and rivets. Throat depth of new model has been increased 1 in. and separate threading attachment, handling 1/8, 5/32, and 3/16-in. stock, is now available. Two additional punches have been added, making it possible to punch holes from 1/8 to 1/4 in. in 1/32-in. depths. Spare punches are available in square, rectangular, and hexagon shapes. Smooth sharp bends can be achieved with bending and forming dies. Up to 90° bends can be formed with single stroke.

Price of tool is $9.95. Threading attachment, $1.

Albert J. Tatu, Inc, 85 Columbia Drive, Williamsville 21, NY

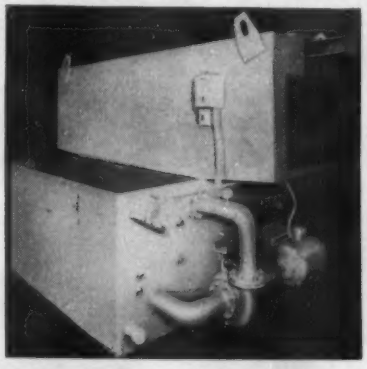


Sphereflex Coupling

Male teeth of each coupling half are cut on spherical arc, while internal teeth are cut with straight root. When misalignment occurs, curved teeth maintain constant area of contact. Teeth are of uniform thickness from side to side. No thrust load on bearings can develop. It is stated that, size for size, Sphereflex couplings will withstand higher horsepower and greater misalignment than comparable couplings.

Units are available in sizes 0 through 6 (maximum bore 6⅝ in.) There is also a selection of floating shafts and vertical couplings.

Philadelphia Gear Works, Erie Ave and G St, Philadelphia 4, Pa



Detrex Spray Washers Are Staged Units

Series 30 Monorail spray washer can be used as a single unit or combined into multiple stage washer. Range covers spray lengths from 4 through 10 ft in two-foot steps. Each washer unit will accommodate work to 30 in. wide. Tanks are constructed of 3/16-in. steel plate with reinforced bottoms and hold 600 to 1000 gal.

Spray nozzles are mounted on swing-ells and adjustable. Nozzle orifices are large and protected with screening one-half the size of nozzle opening. Pumps and motors are located away from aisle space. Either steam or gas may be used for heating; pressures from 50 to 125 lb.

Detrex Corp, Detroit, Mich

BECAUSE *Lusol* IS DIFFERENT . . . WE DARE SUGGEST A SHOP-WIDE TEST!

Prove Lusol—not in just a single machine—but in a lathe, boring mill, grinder, milling machine and drill

THE DIFFERENCE—Unlike ordinary coolants, Lusol is an oil-free, all-chemical concentrate to which you add water to suit the machining operation. Water, the best coolant known, is made wetter so that it gets to the tool point and carries off heat faster. With Lusol there is no rusting, no skin irritation, no smoking to foul shop atmospheres.

YOUR BENEFITS—Superior heat dissipation means that your present equipment can be worked harder, yet your men find things easier—higher speeds and feeds, with less downtime for sharpening tools, finer finishes and closer tolerances. Improved working conditions result in better morale among your employees.

These benefits become shop-wide as your workmen recognize Lusol's advantages and ask for it in their machines.

AN OFFER—Prove to your own satisfaction—in your own plant, in your own machines—that Lusol will do all we say it does. Our field engineers will help you clean out the machines marked for the test and install Lusol in proper concentrations. Past experience in hundreds of metal working machines indicates you'll do jobs faster and better.

TO GET THIS TEST WORKING, MAIL THIS COUPON

We'll have a Lusol field engineer call and arrange to run the test in your own plant.

F. E. ANDERSON OIL CO., INC.
PORTLAND, CONNECTICUT

F. E. Anderson Oil Co., Inc., Box 215, Portland, Connecticut

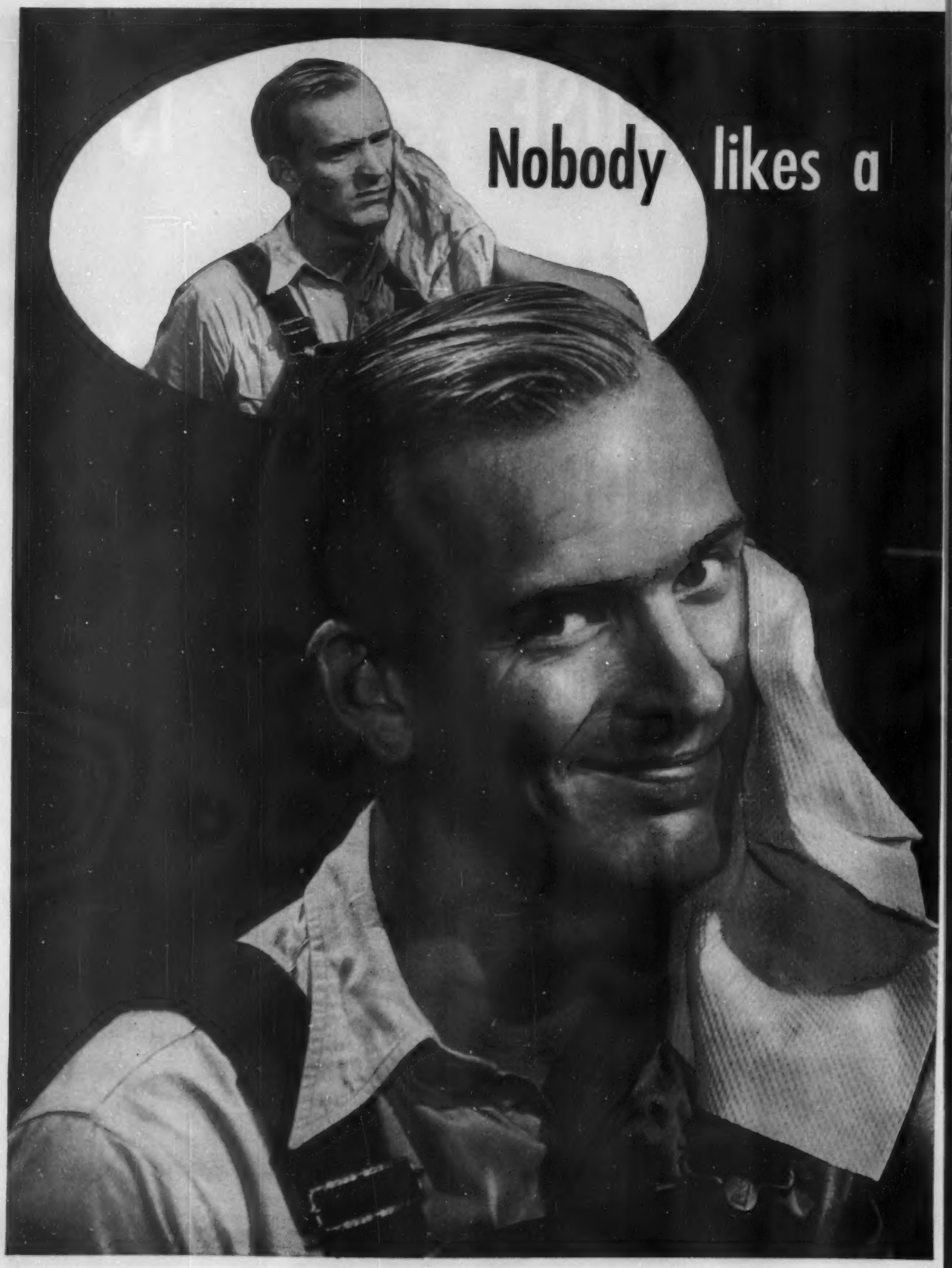
☐ Send me the leaflet, "Case Histories of Lusol at Work" and any other data.

Name_____ Title_____

Company_____

Address_____

☐ Have your man call to discuss arrangements for installing Lusol All-Chemical Coolant in the machines selected for this test. ( )


Nobody likes a

dirty wiper

...Another good reason for switching to **Scott Wipers!**

Because a clean, fresh one is always available—Scott Wipers provide a constant source of clean chip-free wiping material.

Scott Wipers are sanitary and disposable. They greatly reduce the costly scratches and digs in finished work caused by chips lodged in wiping materials. They end the laundering problem and simplify distribution and control.

Scott Industrial Wipers are two-ply and tough yet soft and absorbent. Compare them with whatever wiping material you're using now —for cost, for convenience, for performance.

The Scott representative or distributor in your area will be glad to help you set up a production line demonstration in your plant. Call him or mail this coupon today.

Scott Paper Company, Dept. AM-3, Chester, Pa.
Please send me full information on Scott Industrial Wipers.

Name_____

Position_____

Company_____

Address_____

City_____ State_____

AUTOMATION is a 20 YEAR OLD FACT at PRATT & WHITNEY

The *name*, perhaps, is new, but AUTOMATION . . . with "feedback" control and automatic adjustment . . . has long been a practical working *fact* at Pratt & Whitney. Nearly 20 years ago, for example, P&W Syncro-Timer Control Units, operating in conjunction with P&W Continuous Gages, were successfully applied to the completely automatic classifying and sorting of tin plate on shearing lines. P&W Gages and Control Units that automatically correct the thickness of coating insulation on extruded wire went into operation 8 years ago.

TODAY we are successfully applying the same basic principles to automatically control the screwdowns on tandem and reversing cold strip mills to insure uniformity of product.

No . . . you don't have to wait for *automation* to happen. Its opportunities for added efficiency, improved product quality and lower costs are available *RIGHT NOW* via Pratt & Whitney. Installations are compact, simple and inexpensive. Take advantage of our wide experience. Call in the Pratt & Whitney Specialist now. There is no obligation.

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.
SINCE 1860

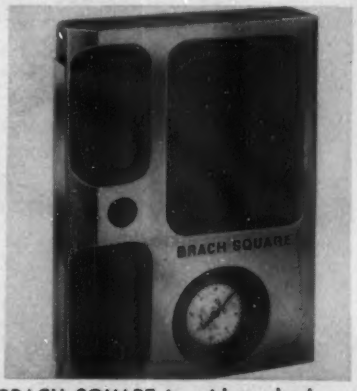
First Choice for Accuracy

MACHINE TOOLS • CUTTING TOOLS • GAGES

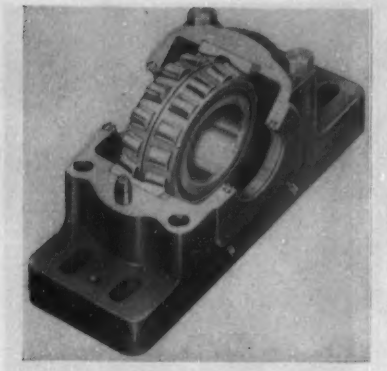
Drilling, Tapping Machine Has Pushbutton Control

Pushbutton-controlled multi-drilling and tapping machine for medium-size work, with new feed and control mechanism, is available with single spindle head, adjustable spindle head, or fixed center spindle head. Pushbutton control offers advantage of the following feed cycles: standard cycle; jump feed cycle; time delay reverse cycle.

National Automatic Tool Co, Inc, Richmond, Ind



BRACH SQUARE is said to check out the true 90° relation between one plane surface and another up to 100 times faster with no sacrifice of accuracy. It is recommended for applications requiring inspection of closely machined parts or for those where periodic tool checks of master working squares are standard procedure. Operation involves placing either serrated base on one surface and contacting pivoted blade to other surface. Reading is taken for reference and square is then inverted to opposite base and another reading taken. Difference in reading shows variation of angle in seconds from 90° — *US Bearing Corp, Los Angeles*

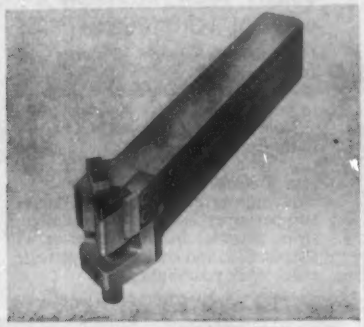


Mill Bearings

Line now includes pillow blocks with self-aligning roller bearings for press fit on shafts. Series LPK 7800F bearings have steel split housings and rugged caps and bases secured with four extra-heavy bolts and large dowels.

Press fit assures positive concentric mounting; locknuts assure positive location.

Link Belt Co, 307 N Michigan Ave, Chicago 1, Ill



Mechanical Tool Holders

Econo-Clamp mechanical tool holders for use with triangular square and round carbide inserts. They feature side and top clamping, and hardened steel anvil; range from 1½ in. length down to ¼-in. Throway Insert. Rugged structure and design reportedly makes it ideal for heavy roughing and precision finishing.

Newcomer Products, Inc, Latrobe, Pa

Abrasive Disk

Depressed center abrasive disk, 3M Type G, is made of aluminum oxide mineral in reinforced fabric-and-resin construction. Both sides and periphery can be used for cutting. Two sizes in grit 24—7 and 9⅛ in. Speed of 5500 rpm is recommended for the larger size and 6000 for smaller. Overall thickness is ¼ in.; arbor, ⅞ in.

Minnesota Mining & Mfg Co, 900 Fauquier St, St Paul 6, Minn

AUTOMATIZING?

PRATT & WHITNEY

has the right gage

. . . to do the job better

. . . at the lowest possible cost

IN AUTOMATION, the first vital link in the automatic control chain is the Continuous Gage. But no single gage type is right for all needs. Only Pratt & Whitney . . . offering a ***complete line*** of Continuous Gages . . . is in a position to recommend and furnish the ***one*** gage type ***exactly right*** for ***your*** specific job requirements! P&W Continuous Gages include:

NON-CONTACTING *(Radiation)*

X-RAY GAGES

. . . for strip and foil. Simple to install and maintain. Stability is excellent, unaffected by voltage fluctuations. RANGES: Steel — .001" to .075"; Foil — 0" to .010". FULL SCALE MAGNIFICATION: ± .00025" on Foil; ± .001" on thicker strip.

BETA RAY GAGES

. . . check a wide variety of metals, alloys and non-metallics. Especially well adapted to gaging coated materials when used with a Proportionate Syncronizer. RANGES: Steel — .030" maximum; Other Materials — to 200 ounces per square yard. FULL SCALE MAGNIFICATIONS: to suit job requirements.

CONTACTING *(Electrolimit)*

MODELS D AND 10-A

. . . continuously indicate thickness variations to .0001" in strip steel and other metals. Combine precise mechanical gaging with electrical magnification. RANGES: to 3/8" thickness by .0001" increments. MAGNIFICATIONS: to suit job requirements.

MODEL B WIDTH GAGE

. . . for narrow strip and flat wire width or round wire diameter. Also used for precision automatic control of coating thicknesses. RANGE: 0" to 2" by .0001" increments. FULL SCALE MAGNIFICATION: ± .005", or to suit job.

CALL IN THE PRATT & WHITNEY SPECIALIST NOW . . . his broad experience can help you make the most of all the advantages AUTOMATION offers you.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

SINCE 1860

First Choice for Accuracy

BRANCH OFFICES AND STORES

CINCINNATI • CLEVELAND • DALLAS (The Source Co.) • DETROIT • LOS ANGELES

HOUSTON (The Source Co.) • NEW YORK • PHILADELPHIA (and) PITTSBURGH

ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

MACHINE TOOLS • CUTTING TOOLS • GAGES

2 revolutionary ways to beat production costs

NEWCOMER ECONO-CLAMP TOOLS

NEWCOMER "THROWAY" CARBIDE INSERTS

Available in ALL STYLES for HEAVY DUTY ROUGHING and ACCURATE FINISHING

Eliminate all grinding . . . cut tool inventories . . . speed production!

NP ECONO-CLAMP TOOLS USE:
- Throway INSERTS
- Half Length INSERTS
- Full Length INSERTS

Here's why modern mass production facilities are saving up to 50% of carbide tooling costs by using Newcomer Econo-Clamp Tools and "Throway" Inserts:

- Ruggedly designed alloy steel holder gives maximum strength.
- Top clamp locates cutting edge accurately with each indexing and provides proper seating of "Throway" inserts on anvil.
- Hardened steel anvil assures solid, flat seating surface for half length or "Throway" inserts.
- "Throway" inserts give multiple cutting edges without grinding.
- Side clamp locks insert into accurate position even under heavy cuts.
- Heavy duty jack screw at bottom of anvil withstands excessive cutting pressures.

Send today for bulletin

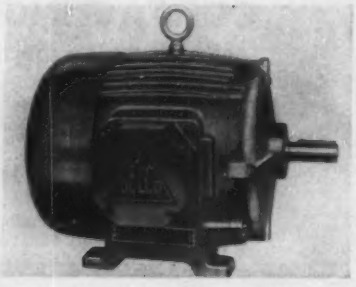
NP — CONTROLLED QUALITY CARBIDE

NEWCOMER PRODUCTS, INC.
Latrobe, Pa.
General Sales Office:
512 Franklin Ave., Pittsburgh 21, Pa.

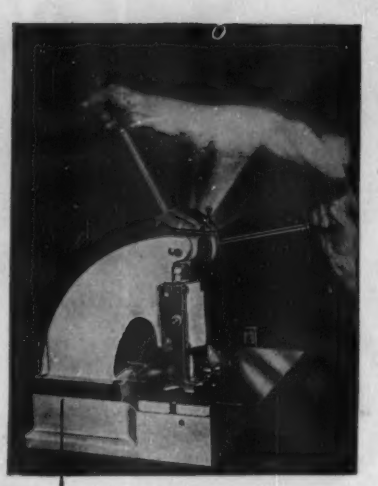
Engine Blocks Produced By Special Machine

Engine blocks are produced two per minute on automative cylinder bore gaging and classifying machine used to simultaneously measure and classify bore diameters in six cylinder engine blocks, to inspect out-of-roundness and taper, and to stamp clasifications. Six air spindles, each with diametrically opposed air jets at four positions are motorized for rapid travel into and out of block, Position of floats in Precisionaire indicate taper out-of-roundness or diameter deviation.

Sheffield Corp, Dayton 1, Ohio



SQUIRREL-CAGE INDUCTION motors have been redesigned by Delco Products Div of General Motors to meet the new NEMA standards on re-rated frame sizes. The new motors in frame sizes from 182 through 326 are said to provide less waste space, lower noise level, less weight, and better appearance. One of the new designs is the open drip-proof motor which features cast iron main and end frames, aluminum die cast rotors, grease lubricated double shielded ball bearings, and exclusive Delcote cotton and varnish insulation — *Delco Products Div, General Motors, Dayton 1, Ohio*



PUNCH... BLANK... EMBOSS... FORM...

Quickly, Easily, Accurately with a DI-ACRO* PUNCH PRESS

Deep throats — 6 and 12 inches — of Di-Acro Punch Presses make them ideal for many operations impossible to perform on most bench presses.

Holes of various shapes and sizes — as large as 4" in diameter in 16 gauge steel — can be punched. Vee shaped ram controls position of punch head assuring perfect alignment. Turret stripper, of exclusive Di-Acro design, strips material from punches of all shapes. Side and back gauges provide exact work positioning.

*pronounced Die-ack-ro

FOUR HAND AND POWER MODELS AVAILABLE

Di-Acro Power Punch Presses are designed for high speed production. Rated capacity, five tons. 180 strokes per minute. Motor driven flywheel and other moving parts are housed in a welded, steel cabinet.

Hand operated Di-Acro Punch Presses are easy to operate, ideal for short run production and experimental work Rated capacity, four tons.

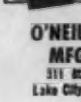
PUNCH PRESS ACCESSORIES

Complete line of standard size punches in round, square, notcher, rectangular and oval shapes available in six clearances. Also special sizes.

Send for 32-Page Catalog

Tells all about both hand and power operated Di-Acro Punch Presses, Benders, Brakes, Notchers, Rod Parters, Rollers and Shears. Punch and Die Cost Sheet included.

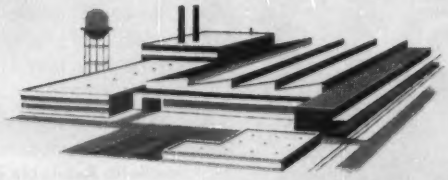
Creators of "Die-Less Duplicating"



di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.
511 8th Avenue
Lake City, Minnesota

$1,000,000 Worth of New Machinery Went Into This Plant Without Changing Capital Structure or Balance Sheet Position



Consider Leased Equipment For Your Expansion Program!

This is but one of dozens of plants, large and small, whose management chose U.S.L's leased machinery and equipment for plant expansion or modernization. Whatever your needs, consider the advantages of United States Leasing's Equipment Lease Plan.

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This is the Service We Offer

United States Leasing Corporation will buy the machinery or equipment you select, from the manufacturer or dealer of your choice, at the price you have agreed upon . . . and place it in your plant on flexible lease terms based on your specific requirements.

The Advantages to You

U.S.L's Machinery and Equipment Lease Plans include these advantages:

Frees working capital for more profitable employment.

Improves balance sheet position.

Charging of rental payments to expense as a tax-deductible item.

Modernization or replacement of obsolete equipment on a pay-its-way basis.

Expansion of plant capacity without changing capital structure.

Pinpoints equipment costs to specific contracts.

The Advantages to Manufacturers

Manufacturers and dealers throughout the United States are using U.S.L. Lease Plans as a sales aid.

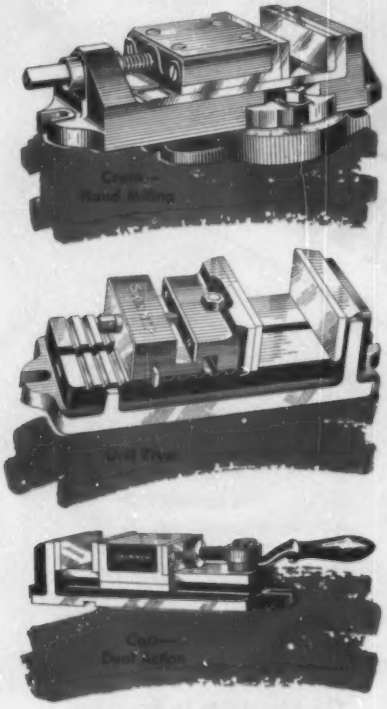
U.S.L. will buy from you the machinery or equipment your customer selects—and place it in his plant on a lease basis.

Write, wire or telephone for information on how to put U. S. L.'s Machinery and Equipment Lease Plans to work for you.

SKINNER

precision machine

VISES



quick action!
positive grip!

Skinner precision milling machine and drill press vises are unequalled in their fast, positive gripping action. They are available in several different models, with either plain or swivel base, to handle all types of milling, drilling, tapping, etc.

Write Skinner or your nearest Skinner distributor for General Catalog.

THE CREST SKINNER CHUCKS OF QUALITY

THE SKINNER CHUCK COMPANY

203 Edgewood Avenue, New Britain, Conn.

Adjustable Bore Gages Obviate Plug Gages

Fifteen sizes of the adjustable bore gages for measuring holes from 0.995 to 6.005 in. Unit consists of pencil-size handle connected by adapters to fixed adjustable torus-design gages at each end. One gage is set to go, the other to no-go. Double end gage has removable washers for recording dimensions.

Each has single micrometer adjusting screw and lock screw that passes through tension nut providing controlled pressure between the two components. Both adjusting and lock screw can be sealed.

The torus, designed for instant entry into bore, detects bellmouth, taper, and out of round. It has micrometer feel that makes it possible to feel variations within 0.0001 in.

M C Hutto Co, 6516 Detroit Ave, Cleveland 2, Ohio

FLUOROSCOPE loads from the front and can be supplied with pushbutton control for rapid opening and closing of the hood. Fluoroscopic screen size of standard model is 16 x 23 in. and inspection area is 18½ x 26 in. Class A cabinet affords complete operator protection. Unit is designed for handling numerous inspection problems — *J W Dice Co, Englewood, NJ*

SKINNER

precision self-centering

SCROLL CHUCKS

POWERFUL!
ACCURATE!
SAFE!
DURABLE!

Skinner self-centering scroll chucks are available in several models, for light, medium and heavy duty jobs in tool room or production runs.

All are of highest quality, made by the most modern machines and methods. Available in sizes from 3″ to 18″, with semi-steel or forged steel bodies, and heat-treated alloy steel for all other parts. Provided with two sets of solid jaws or two-piece jaws for holding internal or external work. Lands on jaw, jaw steps and end bites are ground after the chuck is assembled.

Write Skinner or your nearest Skinner distributor for illustrated folder.

THE CREST SKINNER CHUCKS OF QUALITY

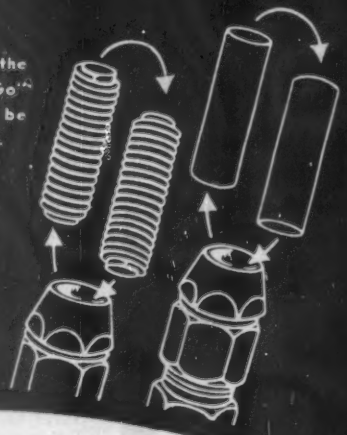
THE SKINNER CHUCK COMPANY

203 Edgewood Avenue, New Britain, Conn.

DOUBLE THE LIFE!

BATH

REVERSIBLE THREAD AND CYLINDRICAL GAGES give at least twice the wear of Taper Lock Gages



Either end of the "Go" and "Not Go" members may be used for gaging.

FEATURES

- 2 Gages for the price of 1
- Adjustable for use as a depth gage
- Color identification for "Go" and "Not Go"

Cut gaging costs in half by doubling the hours of precision gaging with BATH Reversible Gages. They're made to the same uniformity and high quality standards as Bath Regular Thread Gages and Bath Ground Thread Taps.

Special gages to your specifications

JOHN BATH & CO., Inc.
28 Grafton St., Worcester 8, Mass.

RING THREAD GAGES • PLUG THREAD GAGES
INTERNAL MICROMETERS • GROUND THREAD TAPS

Clip and mail coupon today!

John Bath & Co., Inc.
28 Grafton Street
Worcester 8, Mass.

Please send folder . . . I'd like to know more about Bath Reversible Gages.

NAME_____

TITLE_____

COMPANY_____

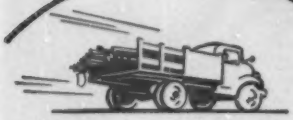
ADDRESS_____

3 Ways YOU BENEFIT BY SPECIFYING

WYCKOFF

Cold Finished Bars

CARBON... ALLOY... LEADED



PROMPT SERVICE

from any of Wyckoff's 4 modern plants at key points in Ambridge, Pa. ... Chicago, Illinois ... Newark, N. J. and Putnam, Connecticut.

TECHNICAL CO-OPERATION

from Wyckoff metallurgists experienced in every phase of cold finished steel practice.

DOLLAR SAVINGS

Wyckoff Quality Control insures uniform maximum production, increased machining speeds and longer tool life.

SPECIALISTS IN COLD FINISHED STEELS EXCLUSIVELY

WYCKOFF STEEL CO.

General Offices: Gateway Center Pittsburgh 30, Pa.

Branch Offices in Principal Cities

Works: Ambridge, Pa. • Chicago, Ill. • Newark, N. J. • Putnam, Conn.

WYCKOFF STEEL PRODUCTS — Carbon and Alloy Steels • Turned and Polished Shafting • Turned and Ground Shafting • Wide Flats up to 12" x 2" All types of furnace treated Steels

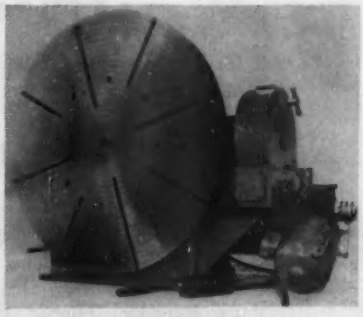
Ram Milling Machine Has Two Table Sizes

Ram milling machine has two table sizes—9x36 in. with 22-in. longitudinal travel, and 9x42 in. with 28-in. longitudinal travel. Designated Model 1½V, machine is equipped with Type 4 precision milling head, a heavy-duty quill attachment which permits operator to work to closer tolerances. Quill has 3½ in. of travel and weight is adjustably compensated. Standard head is equipped with ¾-hp motor.

Milling head has both lever and handwheel feed in range of speeds. Standard: 450 to 6400 rpm, 6 speeds.

The heavy-duty dovetail ram assembly has 12½-in. standard ram travel or 20½-in. optional ram travel. It has a rack and pinion positioning in the locking mechanism.

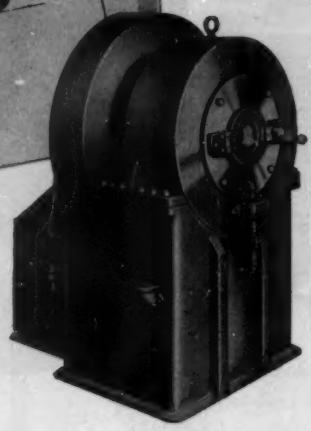
Fray Machine Tool Co, 2935 N Ontario St, Burbank, Calif

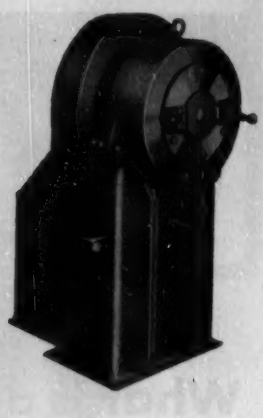


Calibrated Fixture

Rotab is calibrated for movement in all planes. An optical micrometer microscope with glass vernier reticle permits direct reading to 5 sec of an arc. Center spindle is mounted on pre-loaded precision bearings, and extends beyond back plate and provides point for attaching sine bar

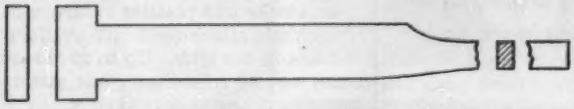
Swaging Success Stories



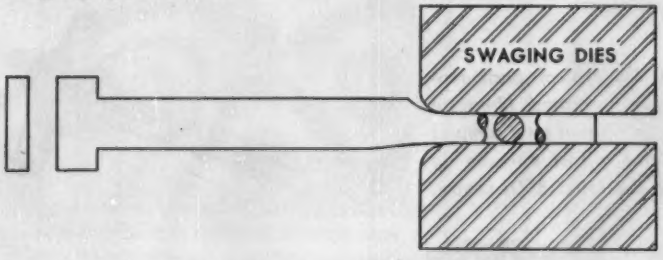


Forming and Finishing Metal Stampings —by Swaging

The application of the swaging process to the forming and finishing of metal stampings has almost unlimited possibilities. Here is an example.



Flat stampings like this one can be given rounded sections, accurately sized, without turning or grinding, by one simple swaging operation.



Can Swaging Improve Your Forming Operations?

1. Swaging is economical—no chips, no wasted material
2. Swaging is simple—can be done by unskilled labor
3. Swaging is fast—gives you increased output of special shapes

Our informative booklet on Swaging may give you other ideas for your own "swaging success story." Why not write for it today?

THE TORRINGTON COMPANY
Swager Department
222 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES

What is done
is DONE...
on the GOSS & DeLEEUW

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

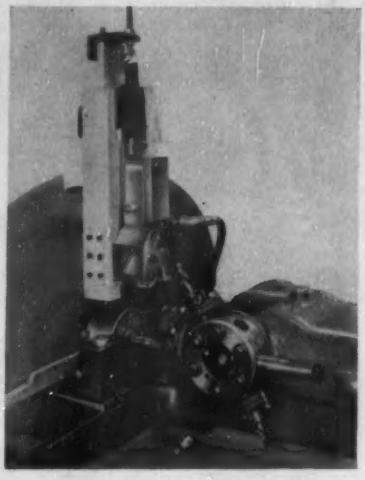
Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

when face plate is in vertical position. Larger and heavier components handled on 36- and 48-in.-dia tables are usually mounted with table in horizontal plane.

Power drive mechanism moves table from horizontal to vertical plane within 15 sec of time. Four sizes: 12, 24, 36, and 48-in.-dia face plate with power tilt on 36 and 48-in. sizes.

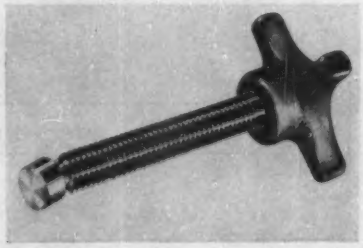
Machine Products Corp, Detroit, Mich



Special Top Slide

Top slide holds Salvo thread rolling attachments, for use in top position of B&S 2G, OG, and 00 automatic screw machines. It is operated with standard cutoff cam and offers rapid advance to feed position and rapid return. Performance features include 5-in. stroke and positive return cam. Four basic attachments are available for use in the slide. Up to 23 thread sizes can be rolled with one attachment by changing thread rolls.

Salvo Tool & Engineering Co, 26441 Gratiot Ave, Roseville, Mich



Toggle Shoe Clamp

Toggle shoe clamp is added to line of jig and fixture components. Retaining spring is used to hold shoe in place and allow 10° adjustment. Shoe snaps on or off, is designed to require

selected for service

GAGE SELECTOR

NET PRICE SELECTORS

For the convenience of cutting tool and fixed gage users and buyers Threadwell presents two more services for more efficient and economical production:

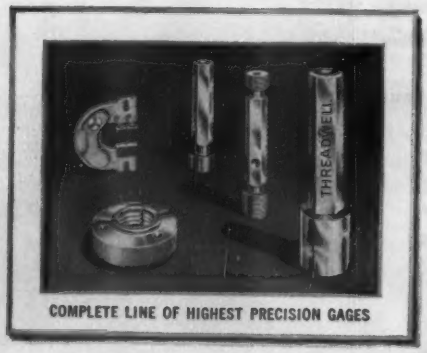
NEW THREAD GAGE SELECTOR—a complete pocket-size tabulation of basic data for thread plug and ring gages, both fractional and numbered sizes from No. 0 to 1½".

NEW NET PRICE SELECTORS—provide quick data on all standard taps, dies, tap and die kits, counterbores and keyway broaches; simply pick the size and style wanted and get the net price instantly.

Ask your Threadwell distributor for these two new members of the Threadwell service family. Ask him too about the long service life of Threadwell's fine cutting tools and gages.

ADJUSTABLE ROUND, 2-PIECE & HEXAGON DIES

KEYWAY BROACHES & SETS



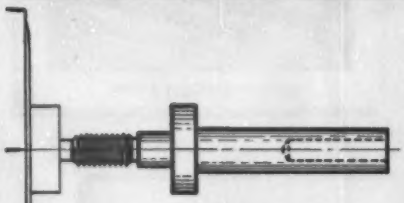
COMPLETE LINE OF HIGHEST PRECISION GAGES

THREADWELL DISTRIBUTORS, too, are strategically located to serve you promptly, properly, and well.

THE FINEST IN CUTTING TOOLS & GAGES

$48,000 SAVED with a REED Thread Rolling Attachment

ON AN AUTOMATIC SCREW MACHINE



Thread: **No. 8-32 NC-3**
Material: **Steel - B1113**
Thread Length: **3/8"**
Attachment Size: **500-G2A**
Machine: **9/16" RA-6 Acme-Gridley**
Rolling Position: **4th**
Production Rate: **450 pieces per hour**

Consistent concentricity maintained with the body of the part. Scrap loss was negligible. Machine down time for setup and changing rolls approximately 8 minutes per 100,000 pieces. Roll life averaged 300,000 pieces per pair of rolls for a total of 8 million pieces.

WRITE FOR THREAD ROLLING ATTACHMENT BULLETIN 1-21

REED ROLLED THREAD DIE CO.

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS
Worcester, Massachusetts, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

030

minimum distance between fixture and work.

Single point contact insures immediate action at first touch of work. Both shoe and screw are heat-treated.

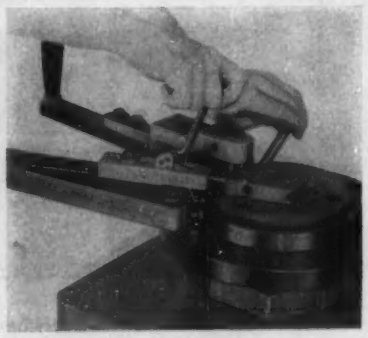
Northwestern Tool and Engineering Co, Dayton 3, Ohio

Pilot Flexible Sleeve For Taper Shank Drills

Pilot flexible sleeve with Morse taper permits taper-shank drills, reams, and end mills to be used again. The unit is made of spring steel and grips tool along full length of taper. When fully engaged it adapts itself to any surface irregularities. Twist of the wrist disengages.

Five sizes, from 1 to 5, with Morse Tapers from 1:2 to 5:6. Type A is for tools with or without broken tangs; Type B for those with broken tangs.

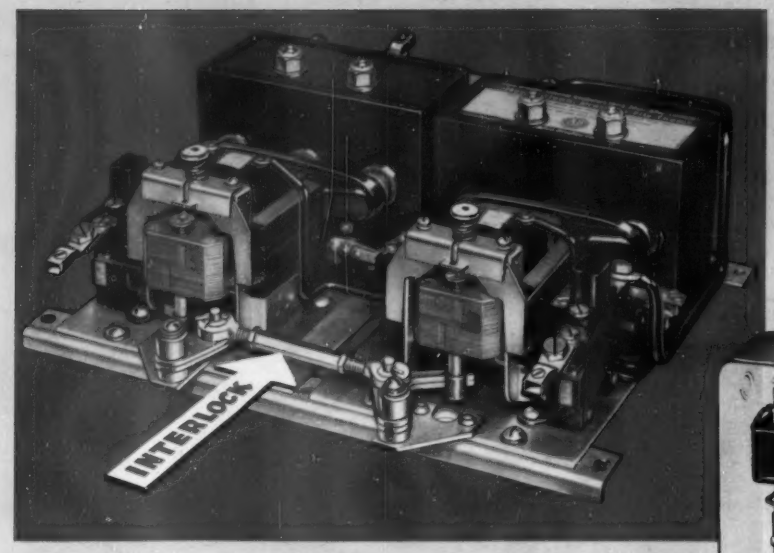
Pilot Tools Inc, 225 Lafayette St, New York 12, NY



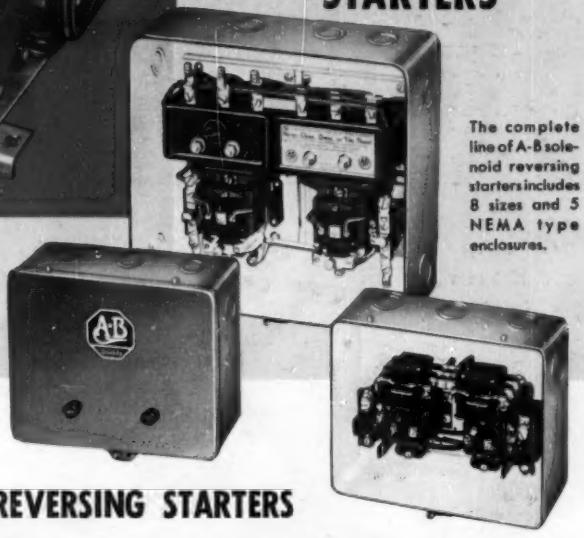
O'Neil-Irwin Clamping Device For Two Di-Acro Benders

Di-Acro Quik-Lok clamp is used for forming tubing, angle, channel, and extrusions on No. 1 and 1A model

BULLETIN 705 REVERSING ACROSS-THE-LINE STARTERS



Allen-Bradley reversing starters have two solenoid contactors—FORWARD and REVERSE—which are mechanically, as well as electrically, interlocked to provide maximum safety for motor and machine.

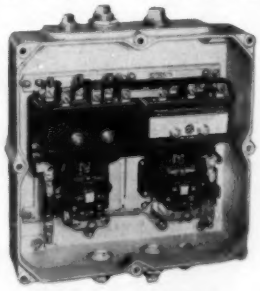


The complete line of A-B solenoid reversing starters includes 8 sizes and 5 NEMA type enclosures.

TROUBLE FREE REVERSING STARTERS

..... up to 300 HP, 220 V; 600 HP, 440-550V.

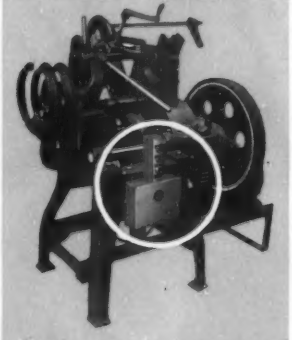
For squirrel-cage or slip-ring motors that must be reversed in their operation, the most dependable control is the Bulletin 705 reversing starter. The two Allen-Bradley solenoid switches ... with their double break, silver alloy contacts ... are maintenance free. Their rugged construction makes them especially suitable for plugging operations. The contacts will not weld or flash over, and they require no cleaning, filing, or dressing.



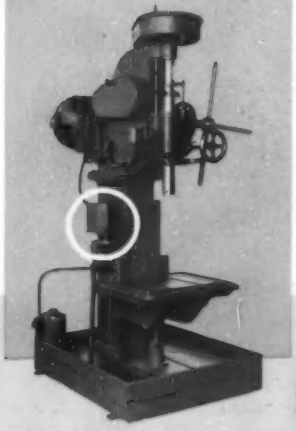
Bulletin 705 reversing starter in NEMA Type 4 waterproof enclosure.

Bulletin 706 combination reversing starters are equipped with manual disconnect switches, with or without fuses. Bulletin 707 combination reversing starters have circuit breakers. Allen-Bradley reversing starters are available with or without overload relays. Listed as standard in enclosures for general purpose, watertight, weatherproof, and hazardous dust and fume locations. Write for A-B Handy Catalog, today.

TYPICAL APPLICATIONS



Excelsior Circular Bending Machine with A-B reversing starter and 3-button control.



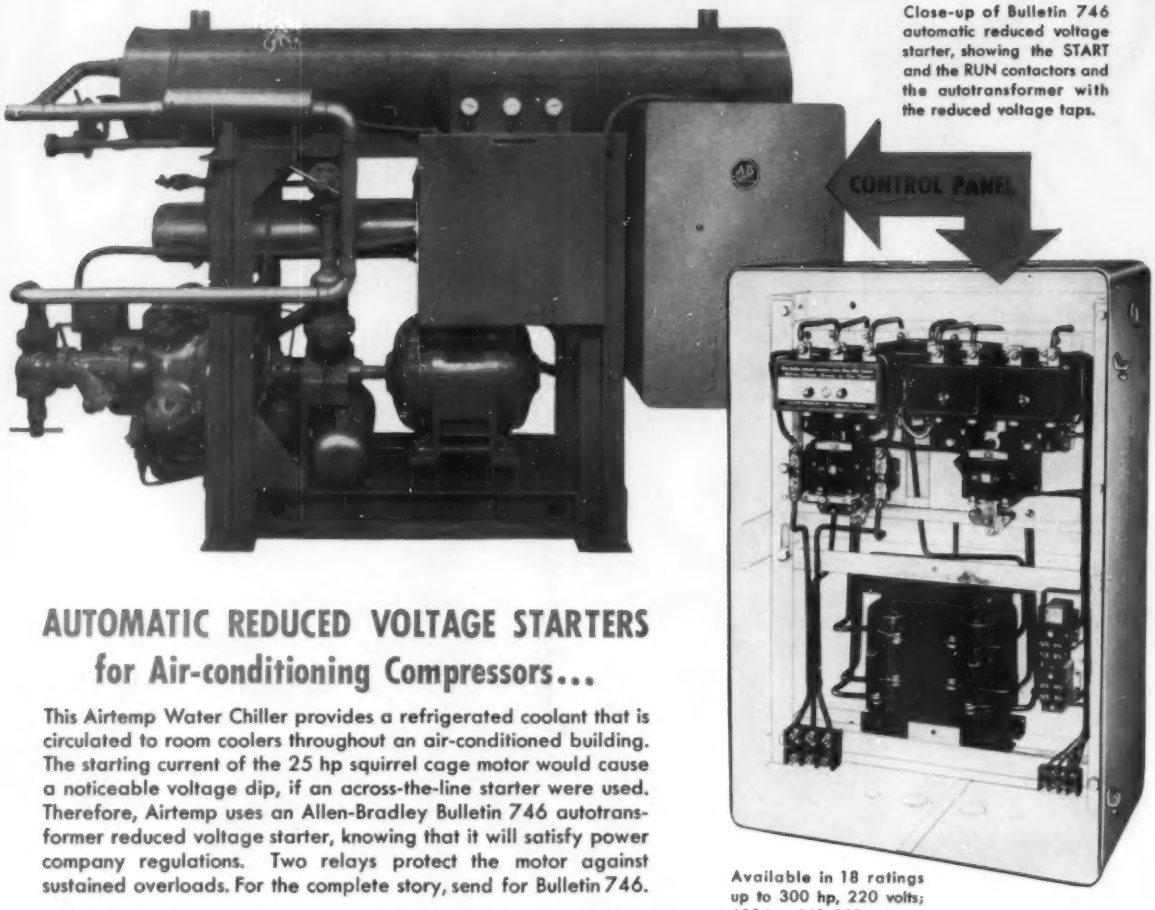
Baker Heavy Duty Drilling Machine with A-B reversing starter in NEMA 1 enclosure.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited—Galt, Ont.

10—54—R

A-B Quality

ALLEN-BRADLEY
BULLETIN 705 REVERSING SWITCHES
QUALITY



Close-up of Bulletin 746 automatic reduced voltage starter, showing the START and the RUN contactors and the autotransformer with the reduced voltage taps.

Available in 18 ratings up to 300 hp, 220 volts; 600 hp, 440-550 volts.

AUTOMATIC REDUCED VOLTAGE STARTERS for Air-conditioning Compressors...

This Airtemp Water Chiller provides a refrigerated coolant that is circulated to room coolers throughout an air-conditioned building. The starting current of the 25 hp squirrel cage motor would cause a noticeable voltage dip, if an across-the-line starter were used. Therefore, Airtemp uses an Allen-Bradley Bulletin 746 autotransformer reduced voltage starter, knowing that it will satisfy power company regulations. Two relays protect the motor against sustained overloads. For the complete story, send for Bulletin 746.

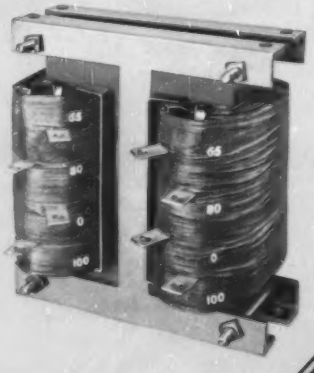
QUALITY COMPONENTS OF ALLEN-BRADLEY BULLETIN 746 AUTOMATIC AUTOTRANSFORMER STARTERS

SOLENOID STARTER

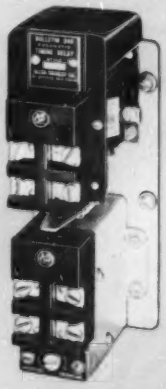
The basic unit of the Bulletin 746 reduced voltage starter is the Bulletin 709 solenoid switch with double break, silver alloy contacts that are maintenance free. They are good for millions of trouble free "starts."

Right — Autotransformer with 50, 65, and 80% taps.

TAPPED AUTOTRANSFORMER



TIMING RELAY



Right — Bulletin 849 pneumatic adjustable timer which controls the time interval between closing of the "start" contactor and closing of the "run" contactor. It automatically disconnects the autotransformer and closes the running contactor for full voltage on the squirrel-cage motor.

10—54—R

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited
Galt, Ont.

A-B Quality

ALLEN-BRADLEY QUALITY

of the Di-Acro Bender. It can be adjusted for radius from 2 in. on first model, to 6 in. on second, will handle stainless steel tubing to ½-in. dia and round steel bar to ⅝ in.

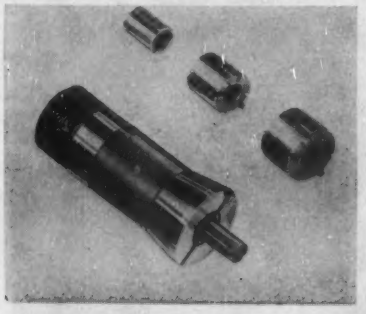
O'Neil-Irwin Mfg Co, 512 Eighth Ave, Lake City, Minn

Universal Expanding Mandrels

Type S super Count-Centric universal expanding mandrel with guaranteed accuracy and concentricity within 0.0002 in. TIR has been added to line. It is similar in design to Type A. Accuracy is obtained by hand lapping vital components. Standard line includes eleven tools for arbors from ⅜ to 7 in.

It is reported particularly adapted to finish grinding, super-finishing, inspecting, and other operations. Both Type A and S are suited for maintenance application.

Le Count Tool Works, Inc, 390 Capitol Ave, Hartford, Conn



Collet Arbor

Collet arbor is expanding type for holding work parts internally. Entire length of part may be finish-machined. It is reported that face of part may be held and machined absolutely square to bore.

Used in place of standard collet, Hole-True collet arbor is actuated by drawbar of machine. When used with production collet attachment, work may be loaded and removed from lathe without stopping spindle.

It is constructed of hardened steel,

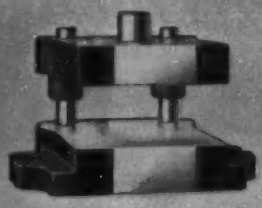
Specify DETROIT
for any type of die set

Special ALL-STEEL
DIE SETS

. . . any type or size of die set, factory-built, factory-assembled and factory-tested to meet the most exacting specifications.

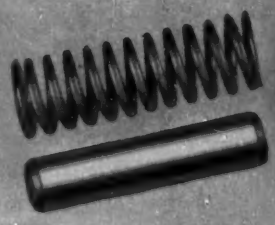
Special SEMI-STEEL
DIE SETS

. . . using premium castings, formulary-controlled for high tensile strength, good machining qualities and exceptionally long life.



Stock PRECISION
& COMMERCIAL SETS

. . . both types available in regular, long narrow and reverse styles in all standard sizes, ready for immediate shipment.



Precision-BUILT
ACCESSORIES

. . . a wide range of high-quality supplies, built to Detroit's precision standards, ready for immediate shipment.

Detroit
DIE SET
CORPORATION

2895 W. GRAND BLVD.
DETROIT 2, MICHIGAN

Call "Detroit"

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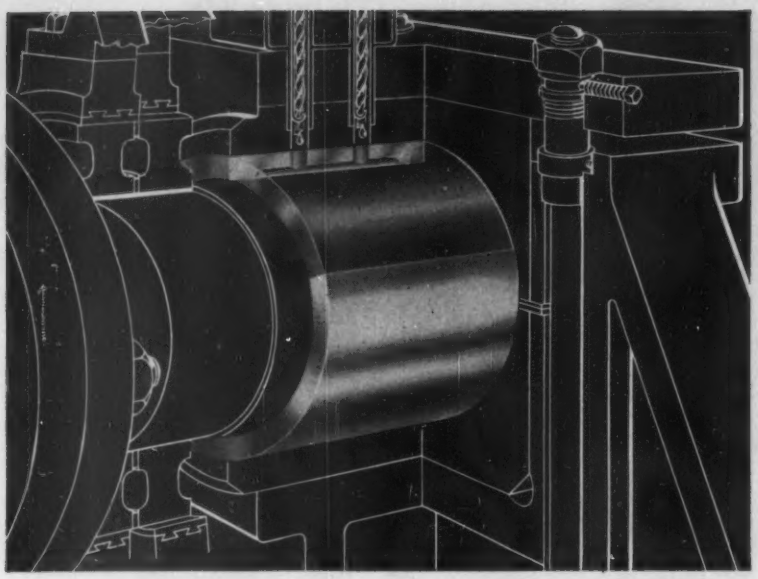
BALTIMORE	PL 2-4641	FLINT, MICH.	5-7361	NEW ORLEANS	RA 6528
BIRMINGHAM, ALA.	54-8621	GRAND RAPIDS, MICH.	CH3-1895	ORLANDO, FLA.	2-3747
BUFFALO	CI 0163	GREENSBORO, N.C.	4-7655	PHILADELPHIA	VI 4-4084
CHICAGO	FU 5-0500	INDIANAPOLIS	HU 5604	PITTSBURGH	LO 1-4011
CINCINNATI	HU 7775	KANSAS CITY, MO.	VI 3558	ROCK ISLAND, ILL.	8-2814
CLEVELAND	TO 1-0860	LOS ANGELES	AD 7251	ST. LOUIS	FR 1-6810
DALLAS	TE 5029	MILWAUKEE	GL 3-7170	SEATTLE	EL 1454
DAYTON	HE 3042	MINNEAPOLIS	OR 5-7980	TOLEDO	MA 4510
DECATUR, ILL.	8-3474	NASHVILLE	6-2597	TORONTO, CAN.	KE 2972
DENVER	SH 2451			WASHINGTON, D.C.	AD 4-5700



THE WAY TO CUT...

Cost of replacement

Any bearing, regardless of type, may one day reach the point where it requires replacement. If this point is reached the replacement of a sleeve bearing is far less costly than the replacement of any other type of bearing.

Disassembly and removal of the original bearing, installation and reassembly with the new bearing are simpler, quicker and therefore less costly and the cost of the sleeve bearing itself is moderate compared to the cost of other types.

The user of equipment which you design and build will appreciate these advantages of a sleeve bearing.

There is a Bunting Engineer near you. Consult him. Or write our Product Engineering Department at Toledo.

Bunting®

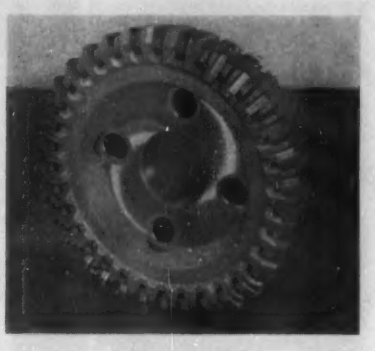
BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

The Bunting Brass & Bronze Company • Toledo 1, Ohio

Branches in Principal Cities • Distributors Everywhere

ground to precision limits. Set consists of Master, ⅜-in. dia, and three hardened and ground adapter bushings to hold work with bores of ½, ¾, and 1 in.

The Medelton Co, Inc, 335 East 142nd St. Bronx 54, NY



Roughing Cutter Feeds More than 100 ipm

Shear Clear face mill feeds more than 100 ipm of rough milling surfaces of automobile engine blocks and heads. Inserted-blade cutter uses new blade angles coupled with Shear Clear's free cutting action. Cutting is done on bevel portion of blade. Tool has tungsten-carbide-tipped blades, and is offered in sizes from 2½-in. dia up.

The Ingersoll Milling Machine Co, Rockford, Ill

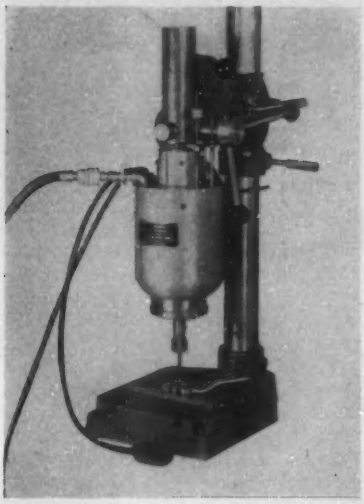
Machine Cleans Hacksaw Blades

Loose scale and sludge is removed from heat-treated hacksaw blades or similar types of stock before painting. Operator loads machine and steam cleaned blades emerge onto conveyor. Blades first pass through cleaning agents where brushes remove all scale and sludge. Steam chamber helps dry blades in

the following stage of operation.

For hack saw blade brushing, 0.008 crimped phosper bronze wire, coiled close wound in a right-hand spiral, is used. Rate of feed is 41 lineal fpm. Power requirements include two 1 hp brush motors, 1/3-hp feed roll motor, and 1/15-hp detergent slinger ring motor.

Fuller Brush Co, Machine Div, Hartford 2, Conn



Electro-Pneumatic Unit Does Sensitive Tapping

Automatic electro-pneumatic tapping unit for high-speed sensitive threading incorporates air motor with electro-pneumatic control which provides for momentary tap reversals at rates to 200 cpm. Tap chuck is driven through triple spiral spring mechanism. Resistance instantly puts into effect whatever rate of tap reverse-and-return is required.

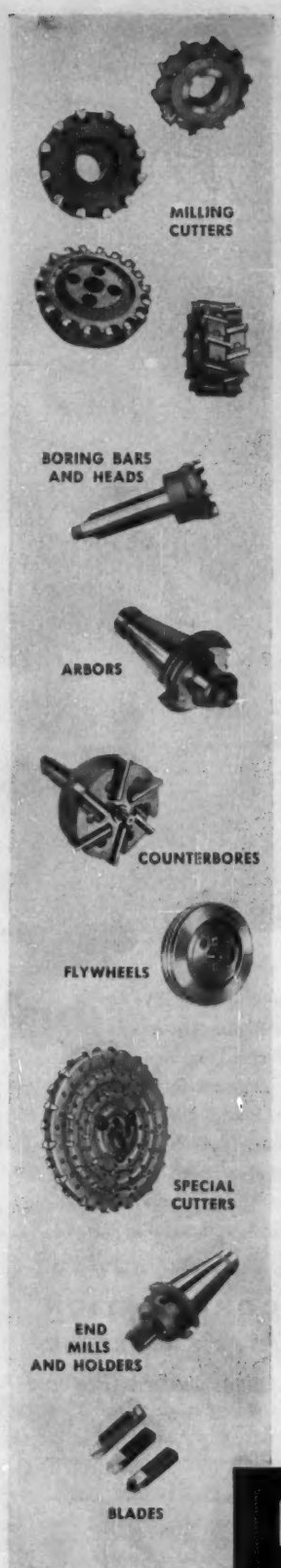
Cutting torque is controlled; taps are accommodated from No. 2x56 to 5/16 in. Unit produces Class 3 threads in materials ranging in hardness up to Rockwell 50_c. Hole depth can be preset within $\pm$ 0.0035 in.

Machine operates from plant air supply in 70 to 125 psi range. It is fully automatic and complete tapping cycle is carried through at press of button or foot switch. Adjustments provided are: permissible tap torque; amount of rotative reversal; depth of thread; and lift-out force. Unit is approximately 13½ in. high.

Smith & Wiese Co, 1265 W Second St, Cleveland 13, Ohio

Plastic cement, Vitroplast, neutral setting, is said to have excellent adhesion to wide variety of surfaces; resistant to many solvents, salts, and acids, as well as to oxidizing agents.

Atlas Mineral Products Co, Mertztown, Pa



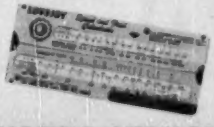
The
Complete
LOVEJOY LINE of Modern Metal Cutting Tools

The Lovejoy line of inserted-tooth type cutting tools has never been more complete — or offered so many features. Every tool has been designed to give maximum production with a minimum of down time for sharpening. Lovejoy tools feature the *exclusive* "Positive-Locking" device that assures rigidity even during heavy intermittent cuts — making them rugged as solid tools. Their housings — of husky forged steel — are designed for longest life.

Lovejoy H. S. S., Carbide and Cast Alloy Blades are interchangeable in the same housing and are stocked for immediate shipment.

For standard or special cutters, call on Lovejoy — suppliers to the world's leading manufacturers for over 35 years. Write today for Catalog No. 28 which describes the full line of Lovejoy tools.

"Speed & Feed Calculator" free on request

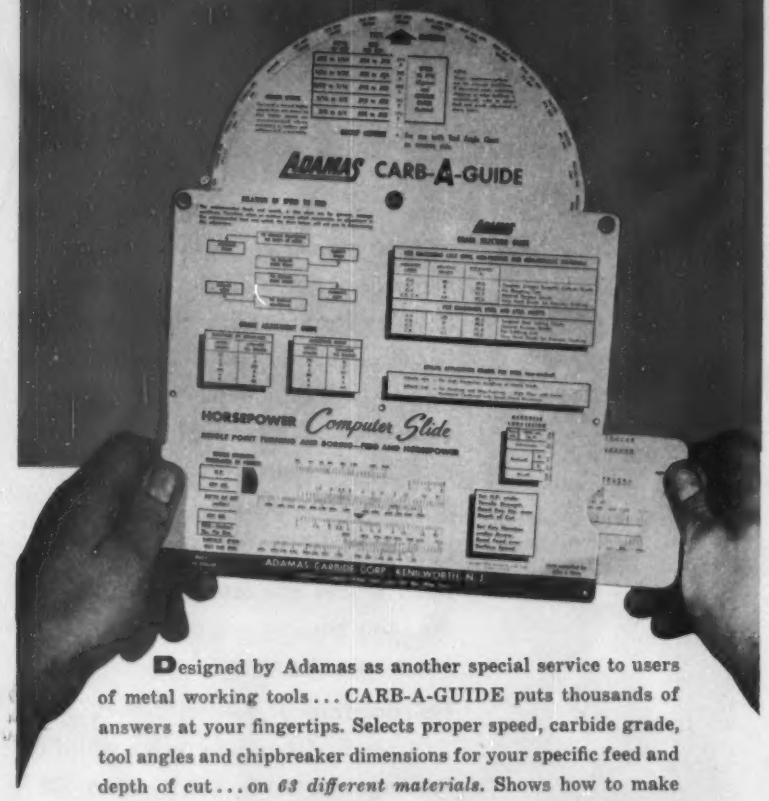


128 MAIN ST., SPRINGFIELD, VERMONT

LOVEJOY TOOL COMPANY, INC.

for quick, sure answers to your carbide application problems...

ADAMAS
TUNGSTEN CARBIDE
CARB-A-GUIDE



Designed by Adamas as another special service to users of metal working tools... CARB-A-GUIDE puts thousands of answers at your fingertips. Selects proper speed, carbide grade, tool angles and chipbreaker dimensions for your specific feed and depth of cut... on *63 different materials.* Shows how to make necessary adjustments in speed, feed, and grade. Includes speed conversion, milling feed, horsepower computer slides. Send for your CARB-A-GUIDE today. It's your assurance of maximum efficiency from the best in tungsten carbide—Adamas Carbide.

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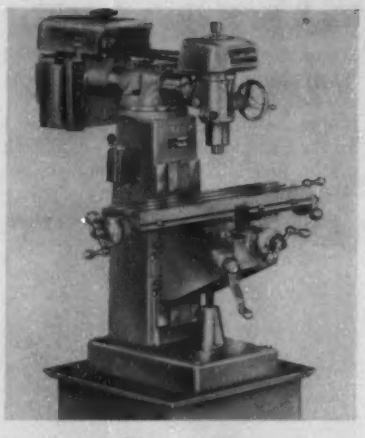

Vertical Milling Machine Has Swiveling Head

Vertical milling machine incorporates spindle heads which can be swiveled in vertical plane and set at any angle, and turret which rotates in a horizontal plane.

Precision drive has 7 ball bearings; ground spindle is hard-chrome plated; quill, ground and hard-chrome plated, has full-length honed bearing in head; ground overarm is electric furnace casting with ¾-in.-thick walls. Quill has micrometer depth control stop and two feeds, lever and handwheel. Table surfaces and all dovetail ways are precision ground. Ways have gibs for lasting accuracy.

Specifications include: 6x24-in. table with 15-in. longitudinal and 5-in. transverse travel; 12-in. vertical knee travel; 8¾ in. maximum, spindle to column; 3 in. quill travel; 6 spindle speeds; choice of No. 7 B&S or No. 2 MT spindle; operation from ½ or ¾-hp motor.

Clausing Div, Atlas Press Co, North Pitcher St, Kalamazoo, Mich

Turning Tools

Chip-Hog line of heavy-duty turning tools includes carbide inserts clamped to durable high-alloy steel shanks, adjustable in two ways. Greater rigidity is said to allow maximum feeds and speeds without danger of carbide cracks.

The Gairing Tool Co, Box 478, Detroit 32, Mich

Typical application for Atlantic cutting oils, showing a Barber-Colman milling machine.

NEW ATLANTIC cutting oils

for high production on tough jobs

Here at last is really effective help in keeping production high in your milling, turning, and drilling departments.

With these new Atlantic non-soluble cutting oils, you can maintain high production rates without the handicap of foul odors on hot tough jobs. Work is visible right through the oil. And the oils are compatible when blended—even down to the heaviest grades. Operators like these new oils better too, because they don't indelibly stain hands or clothing.

Get complete information on these new oils and your copy of the Atlantic Cutting Oil Selection Chart. Learn about this superior measure for cutting oil efficiency . . . determined by performance rather than chemical composition. Write your nearby Atlantic office listed below, or The Atlantic Refining Company, 260 South Broad St., Philadelphia 1, Pa.

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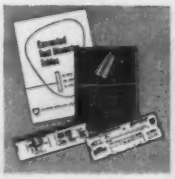
430 Hospital Trust Bldg.	Salina and Genesee Sts.	First and Penn Aves.	Chamber of Commerce Bldg.

Look what you can do with Alcoa® Aluminum on your six-spindle Conomatics

Conomatics are the only multiple bar automatics built with short, "weaveproof" upright frame members secured between a large, heavy top bed and base. Such construction makes possible a strong bridged support for the tooling area and its "work and tool axis."

With such a strong and sturdy frame, you can really "horse" Alcoa Aluminum Bar Stock through your Conomatics. Finished parts are smooth, with dimensional tolerances held to consistently close limits. Piece costs are lower, since from a pound of aluminum you can get three times as many parts as from a pound of the heavier metals. What's more, aluminum parts won't rust or corrode and are exceptionally good conductors of electricity and heat.

Find out more about Alcoa Aluminum Screw Machine Stock—today. Contact your local Alcoa sales engineer or Alcoa distributor. Both are listed under "Aluminum" in the classified section of your telephone directory. Or write, ALUMINUM COMPANY OF AMERICA, 874-M Alcoa Building, Pittsburgh 19, Penna.



PRODUCTION AND DESIGN ENGINEERS will want two Alcoa booklets, *Alcoa Aluminum in Automatic Screw Machines* and *Corrected Tool Diameter Tables*. Also available at no extra cost are two precision computers —a Speed-Feed calculator, and an alloy property guide which shows at a glance the various properties of Alcoa Aluminum Screw Machine Stock.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Look what *You* can do with Alcoa Aluminum on your Acme-Gridley automatics

Free-machining Alcoa® Aluminum Screw Stock and your Acme-Gridley automatics form smooth-working, fast-working teams. They can knock out aluminum parts easily, cheaply and fast. With aluminum, you can take full advantage of Acme-Gridleys' direct, close-coupled camming and wide-open tooling zone features to thread, tap, ream or deep drill. High speeds and feeds are possible with good surface finishes and close tolerances, uniformly maintained.

Piece costs are much lower since you can get three times as many parts from a pound of aluminum as from a pound of heavier metals. In addition, they are excellent conductors of electricity and heat. Aluminum parts take all finishes and are highly resistant to corrosion.

Find out for yourself what *you* can do with Alcoa Aluminum Screw Machine Stock. Contact your local Alcoa distributor or Alcoa sales engineer—your sources for Alcoa Aluminum and your short cut to experience in machining aluminum. Their offices are listed under "Aluminum" in the classified section of your telephone directory. Or, write ALUMINUM COMPANY OF AMERICA, 874-M Alcoa Bldg., Pittsburgh 19, Pa.

Alcoa offers *Alcoa Aluminum in Automatic Screw Machines*, a 95-page book containing information on tool design, setup and operating techniques. It is available to you at no cost just by writing on your company letterhead telling us your job function.

ALCOA ON TV brings the world to your armchair with "SEE IT NOW" featuring Edward R. Murrow, Tuesday evenings on most CBS-TV stations.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

"I sure love to watch this fellow work — with those BUSTER ALLOY tools!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

MANCO GUILLOTINE HYDRAULIC PUNCHES

Model P-20-186

Capacity 1" hole in 3/8" mild steel. Reach 15/8". Weight 44 lbs. Available with high-speed electric hydraulic or portable manual pump.

HIGH CAPACITY . . . STRUCTURAL OR FIELD WORK

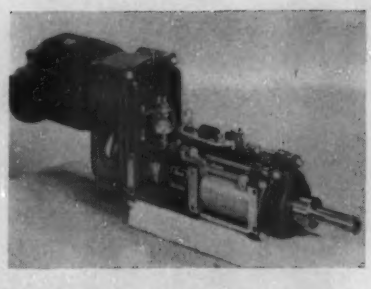
There is a wide variety of fast, powerful Manco Guillotine Hydraulic punches with varying capacities, available for stationary production use, semi-portable boom-mounting, or complete portability for use in the field. Model P-75-E, above, equipped with Manco high-speed electric hydraulic pump offers 75 tons thrust and capacity for 1" hole in 3/4" steel. Other models up to maximum capacity for punching 3 3/4" hole in 16-gauge sheet.

Write, stating requirements: hole size, location, quantity, accessibility, material punched

Dept. AM-12-A

MANCO MFG. CO.

Bradley, Illinois



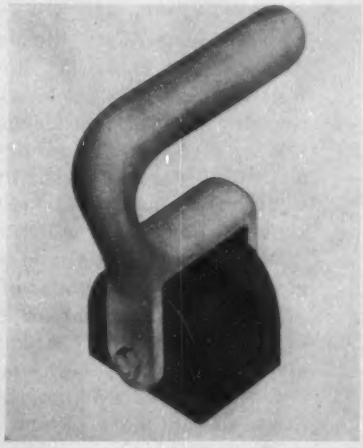
Air-Hydraulic Tool Unit is Self-Contained

Model 34 Holomatic has self-contained electric motor pulley drive system designed to use timing belt or V-belt drives. Speeds from 300 to 10,000 rpm can be established by interchange of pulleys and motors. Motors of ½, ¾, 1, 1½ and 2 hp.

Work loads of up to 200 lb-in. of torque can be handled (¾ in. in mild steel). Drilling, reaming, spot-facing, chamfering, tapping, threading, and hollow-milling can be accomplished. Automatic hydraulic oil filling system maintains oil level. Advance and retract thrusts are developed by air pressure with single or multiple feed rates and rapid travel movements established by adjustable hydraulic controls.

Stroke is adjustable to 4 in. Automatic, semi-automatic or manual cycling, skip drilling, back feeding, manual jogging, and positive stop with dwell can be accomplished.

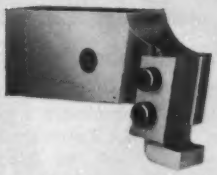
Hause Engineering, Montpelier, Ohio



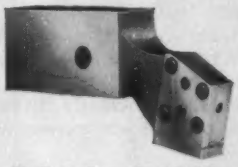
UNIVERSAL TOOL was designed for lifting operations on ferrous metal sheets. Termed Magic Pick-Up Tool, it is said to simplify the job and to be regularly built with a 20, 30 or 45-lb. lift neoprene covered Alnico V magnet set in a high-tensile aluminum handle ***— Standard Portable Cord Co, Inc, Jamestown, NY***

GREENLEE *Automatics*

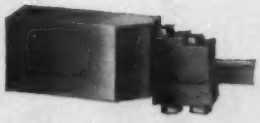
Circular Form-Tool Holder



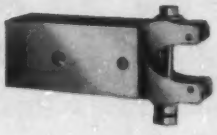
Dovetail Form-Tool Holder



Bit-Type Form-Tool Holder



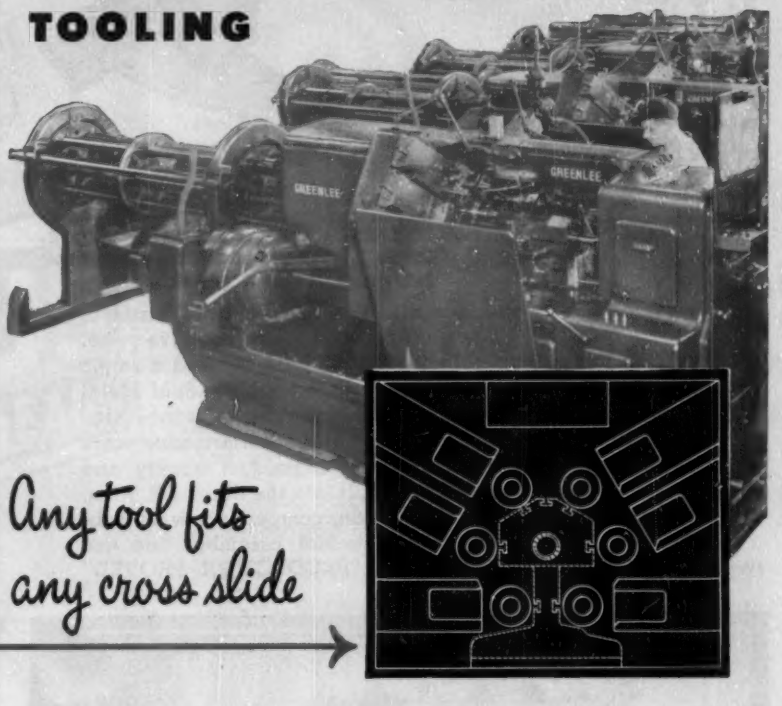
Cut-Off Tool Holder



Knurling Tool Holder

Stenciling Wheel Holder

INTERCHANGEABLE TOOLING



Any tool fits any cross slide

SAVE TIME AND MONEY REDUCE JOB COSTS

Among the cost-saving features of Greenlee Automatics, one of the most advantageous is the arrangement whereby *any* of various standardized tool holders will fit in *any* of the six cross-slides. This means not only no limitations as to what tools can be used in which positions, but also a minimum requirement for investment in tools, and a maximum of speed in tool setting when changing over between jobs. *You can profit* from this and the many other outstanding features of Greenlee Automatics.

Write for FREE Literature

Send today for your copy of our 20-page booklet describing and illustrating all the Greenlee features.

PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO.
1732 MASON AVE., ROCKFORD, ILL.

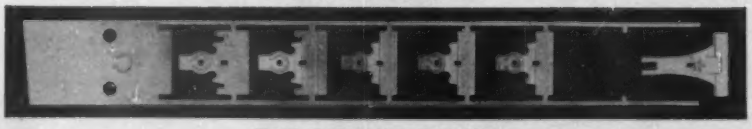
B. Jahn DIES PRODUCE

Every Metal Component of the Eversharp Hydro-Magic Razor!

TO LESS THAN WHISKER-THIN TOLERANCES... WITH "PRODUCTION PROVED" PERFORMANCE AND ECONOMY!

Eversharp-Schick specified dies to mass produce a razor of superior quality . . . flawless operation . . . competitive price. Working against a tight schedule, B. Jahn evolved a series of progressive dies that turned out each individual metal component used in the razor! Every close tolerance was faithfully met — all specifications of die performance were adhered to — every requirement of product quality and accuracy was engineered and built into the dies by B. Jahn. To guarantee customer satisfaction, components were submitted to Eversharp-Schick for actual assembly line use before the dies were certified "PRODUCTION PROVED" and shipped!

12 STATION DIE RIBBON



7 STATION DIE RIBBON

9 STATION DIE RIBBON

5 STATION DIE RIBBON 3 STATION DIE RIBBON 3 STATION DIE RIBBON

Send today for the fact-packed, picture story of "B. Jahn Production Proved Dies!"

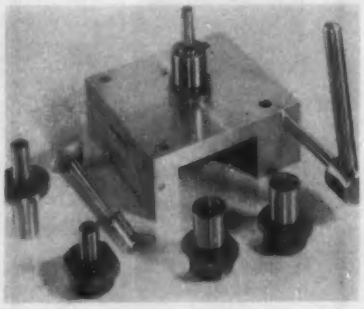
B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Hydraulic Tapping

Automatic milling of three dimensional complex contours is now possible on up to No. 3 standard milling machines by use of Duplomatic hydraulic copying and tracing attachment. Stylus has micrometer adjustment that can follow up to 90° in 1:1 ratio. Eight geared spindle speeds range from 290 to 3250 rpm. Spindle motor and hydraulic power unit are independently driven. Operating controls are conveniently located.

Imported by S&S Machinery Co, 140 53rd St, Brooklyn, NY

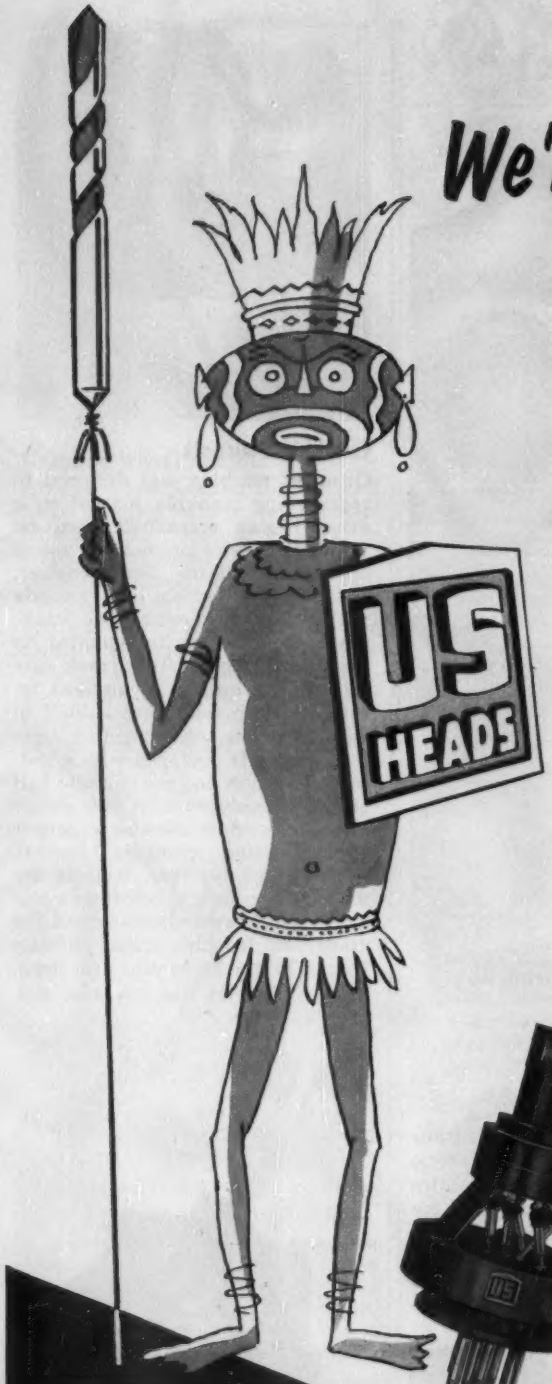


Internal Collets

Ross Master internal collet is a multi-purpose tool for accurate internal holding. It is made of tool steel, hardened and ground. Collets for the 11 and 12-in. Logan lathe are in full production; collets for Clausing, Atlas, South Bend, Regal and Hardinge are available on specific order. Soft pads will be supplied in the near future. Unit is said to be accurate to 0.001 TIR and grip firmly without scoring bore. Standard size working body diameters are 0.750, 0.875, 1.000, 1.125 and 1.250 in. All lengths are 1.250 in.

Velocity Engineering, Div Morris and Batchelor, Inc, Glendale 3, Calif

We're Looking for Head Hunters!....



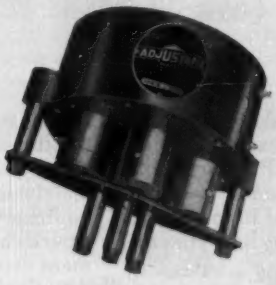
Most machine tool men have long relied upon the "US" Adjustable Multiple Spindle Drill Heads. But we are looking for those who still haven't tried them . . . and who are looking for the best.

With their quick-change universal joint assemblies, they are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating. All gears are hardened and shaved with spindles superfinished.

The single eccentric type is used for equally spaced holes on bolt circles.

The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.

Universal joint with slip spindle fixed locating plate



Double eccentric type for irregular spacing

Single eccentric type for equally spaced holes on bolt circle

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

UNITED STATES DRILL HEAD COMPANY

616-618 BURNS STREET • CINCINNATI 4, OHIO

SUPREME is on the grow!

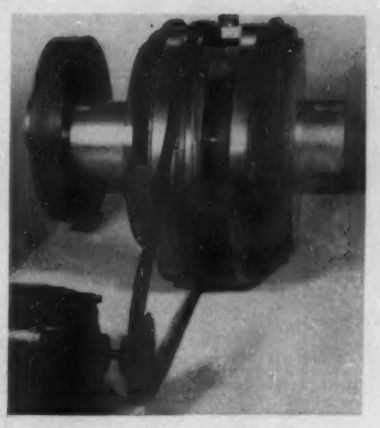
Industry has been asking for them. Now, after the most exacting on-the-job tests, Supreme Products, Inc. announce the addition of two new large capacity Supreme Brand Chucks to their ever-expanding line. They are:

(1) Model No. 9T3 with 3/16" to 3/4" capacity.
(2) Model No. 15T33C, 0" to 1/2" capacity drill press chuck with ball bearing lock collar.

With these two new chucks, Supreme now has a total of 30 separate and distinct models for the industrial and O.E.M. user to choose from. It means that the *extra performance* of Supreme is now available to virtually the entire metalworking industry. See and try Supreme Chucks. Learn why Supreme Chucks have become standard equipment on so many of the products of America's foremost tool manufacturers.

Order from Your Distributor

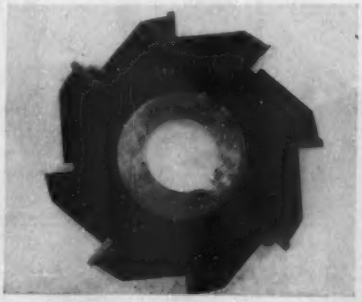
Supreme
PRODUCTS, INC.
2222 So. Calumet Avenue
Chicago 16, Illinois



Crankpin Journals

Grinding machine was designed to regrind any crankpin journal on a diesel engine crankshaft used on standard railway locomotives, power house, and marine diesel engines. Part is ground within the crankcase without having to remove the crankshaft. Machine can be mounted on crankpin journal within crank case through the inspection windows located on each side. Unit is built in two parts, then bolted together. One-half section is equipped with grinding mechanism and the opposite half section is equipped with gear reducing unit to rotate machine at proper speed around crankpin journal. When bolted together, sections are driven by a single V-belt from a 1½-hp. motor located either side of the crankcase. Machine grinds journals from 6 to 8½ in. in dia., 6 in. long.

Metco Inc, 733 Egleston Ave, Kalamazoo, Mich

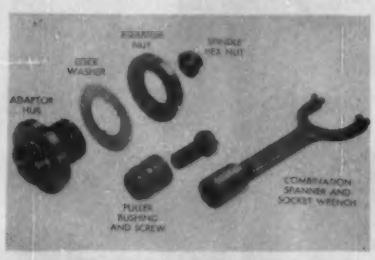


Anchored Tips For Carbide-Saw Line

Long carbide tips confined in body slots below flute depth in slotting saws insures better braze strength and longer saw life. New quality line is available in any decimal width

from ⅛ to ½ in. wide. Special dias and hole sizes available; but one catalog sheet covers all decimal standard widths.

Millit, Inc, 55 Flint Street, Rochester 8, NY

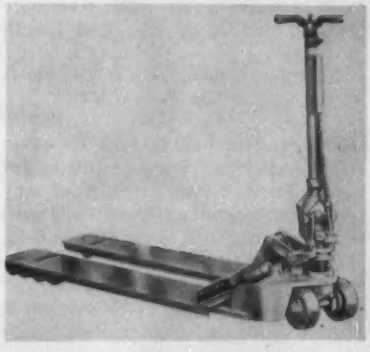


Grinding Wheel Adapter

Ground wheel adapter for tool and form grinding wheels incorporates wheel-pulling accessory. Adapter employs hex head instead of conventional slotted head spindle nut.

Three sizes are available for grinding wheels to 1⅛ in. thick. Puller consists of threaded steel bushing which screws into open end of adapter. A 1½-in. puller bolt screws through the puller bushing pressing against end of spindle.

The Wm Sopko & Son Co, 140 E 267th St, Cleveland 23, Ohio



PILOT LIFT TRUCK, 2500-lb capacity, is said to be priced lower than most units of similar capacity. Pal Boy is available in 24 and 27-in. widths and 36, 40, 42 and 48-in. fork lengths. All wheels are of ball-bearing design with extra ball-bearing booster rollers. Unit has full 270° lifting handle and safety spring prevents handle from dropping. It revolves in 360° swivel
—*West Bend Equipment Corp, 435 Water St, West Bend, Wis*

Flush pin gage blanks, standard barrel and bar design, are available finished complete except for grinding range and step dimensions.

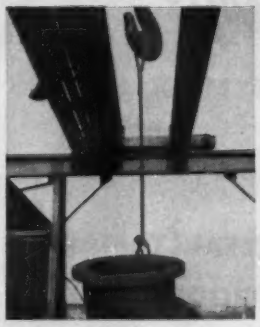
A G Davis Gage & Eng Co, 21435 Dequindre Rd, Dept A-1, Hazel Park, Mich

ACCO Registered* Slings

ACCO Quality

It's Flexible—and It's ALL Steel CABLE-LAID SW-56

Single leg used in basket hitch around heavy rough casting



Another leg used in choker hitch through opening of cast elbow

Two legs used as whip slings for heavy unbalanced load

"It's the most useful sling we have ever had"

• This is what users say because ACCO Cable-Laid has the flexibility of manila rope but the strength of steel. It's made from improved plow steel wire for greatest known strength. Yes, even the independent wire rope core is made of the same tough wire.

The high flexibility of ACCO Cable-Laid comes from the construction of the rope. It's not just six strands around the core, it's six separate wire ropes laid around the wire rope core. This is also what gives ACCO Cable-Laid its fine resistance to kinking even after used around square corners.

Add to ACCO Cable-Laid the patented DUALOC ending—and the ACCO half-thimble —and you have a sling which can't be beat for all-around usefulness and low cost lifting. In addition to the inherent advantages of the ACCO Cable-Laid construction, these slings are ACCO *Registered* with all of the advantages this specification assures.

Get full details of the SW-56 ACCO Registered Cable-Laid and other ACCO Registered Wire Rope Slings from your nearby ACCO Registered distributor—or write us at Wilkes-Barre, Pa.

**Trade Mark Registered*

ACCO TRADE MARK

Wire Rope Sling Department
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. • In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

for Better Value

Mark

THE NEW YEAR WITH DATE STAMPS

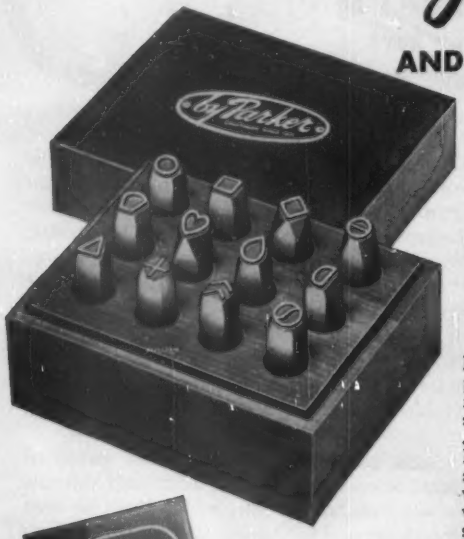
by Parker

Parker date stamps are used throughout industry to permanently mark tools, products, assemblies with confidential date of production. Sets consist of 12 alloy tool steel date stamps, each bearing the key letter — which changes annually — that denotes the year and a number to indicate the month. Stocked in 1/16", 1/8" and 3/16" character sizes or custom made to specifications.

Inspection

AND SYMBOL STAMPS

by Parker



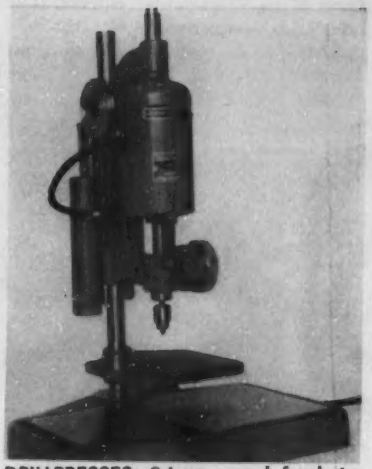
CLEARLY MARK PRODUCTION DATA . . .

For countless identification applications on virtually all materials, Parker inspection and symbol stamps mark quickly . . . easily . . . permanently. Designed for lifetime use, these stamps are furnished plain or with one, two or three numbers within the border. Available in standard sizes of 1/16", 3/32", 1/8", 3/16" and 1/4" or special symbol stamps may be exactingly reproduced in any quantity to your specifications.

The answer to every industrial marking problem will be found in "Marking Tools" — yours upon request.

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker



DRILLPRESSES, 8-in. manual feed, incorporate several improvements. Micro Feed uses planetary roller system. Quill return counter balance has been changed from arm to pulley-and-weight arrangement. Combination is said to result in more sensitive machine for drilling fine holes — *Electro-Mechano Co, 261 East Erie St, Milwaukee, Wis*

Welding rod, copper-coated, designated No. 3 general purpose cast iron rod, has lower working temperature than the rod it replaces, 1400 vs 1500 F, and requires less preheat, 600-800 vs 600-1000. Available in 3/16 and ¼-in. dia. Rod length is 18 in.

All-State Welding Alloys Co, 249-55 Ferris Ave, White Plains, NY

Kaylock hex nut is said to effect weight savings up to two-thirds, yet has highest axial strength of any comparable product. Withstands temperatures of 550 F. Available in 6-32, 8-32, 10-32, ¼-in.-28, 5/16-in.-24, ⅜-in.-24, and 7/16-in.-20 tap sizes.

The Kaynar Co, Kaylock Div, 820 E Sixteenth St, Los Angeles, Calif

Micrometer gage, Model 127, directly reads end diameters of chamfers up to 1 in. from 90° to 127° included angle. Can also be used for computing chamfer depths. Details in Bulletin 106.

Acme Industrial Co, 200 N Laflin St, Chicago 7

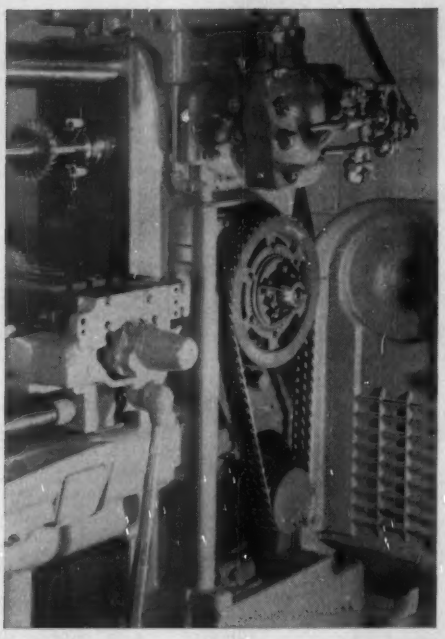
Automark electric typewriter for metal nameplates has redesigned table feed mechanism with automatic shifting; heavy-duty table with precision control knob for accurate adjustment; line and margin spacer; and increase in number of type faces available.

Defiance Machine & Tool Co, 1920 S Vandeventer, St Louis 10, Mo

Can Veelos V-Belts

CUT VIBRATION

20% to 90% in your machines?



MACHINE vibration is usually caused by one or more of these five factors: bearings; motor; clutch; sheaves; v-belts. Frequently, v-belts alone are the major cause of vibration.

Actual performance on many different types of machine tools has proved that Veelos v-belts can reduce vibration 20% to 90%.

Here's why this is so...

Regular v-belts have spots of varying density due to their construction. These spots, though not apparent, throw the belt out of balance when the drive is operating. Vibration is created which not only can cause excessive wear on parts of the machine but which may also damage the finished work.

Veelos v-belts have none of these spots. Every Veelos belt is perfectly balanced throughout its entire length. Every Veelos link and stud is absolutely uniform. The smooth, machine-cut sides and the laminated construction of the belt assure full, vibrationless power delivery.

These facts can be readily demonstrated with an electronic analyser. This analyser measures amplitude of vibration to as low as 2-millionths of an inch. A few minutes is all that is required to show you that Veelos runs smoother and creates less vibration than regular v-belts.

Drop us a line or clip the coupon for a demonstration.

Veelos is known as Veelink outside the United States.

VEELOS
THE LINK
V-BELT

Manheim Manufacturing & Belting Company
601 Manbel St., Manheim, Pa.

Yes, I would like a demonstration with the electronic analyser. Have your representative call me for a convenient time.

Name.....

Company.....

Address.....

.....

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Precision
DUPLICATING
on ANY Engine or Turret
LATHE

Lehigh
TRACER-TOOL
PROFILE-TRACING
LATHE ATTACHMENT

No Complicated Hydraulic or Electronic Controls

Fast set-up for short or production runs. Requires no permanent lathe alterations. Accommodates all types of tool holders, square turrets, grinding attachments, clapper boxes, boring bars, etc. For contour turning, facing, grinding, boring, Bullard operations. Unlimited radii, 90° steps, threading to a shoulder, etc. Uses low cost, easily made templates. Models for all lathes 9" to 24" and larger. Thoroughly proven in shops and plants of every size.

Model M-1500

Write for catalog or engineering help on any duplicating problem

AIR CONTROL DIVISION

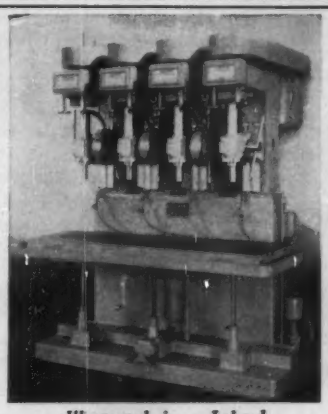
Lehigh Foundries, Inc.

1501 LEHIGH DRIVE, EASTON, PA.

Manufacturers of LEHIGH Air Valves • Air Cylinders • Air Hoists • Air Motors

West Coast Dist.: CAMPBELL CONTOUR ATTACHMENT CO., 1320 W. Esther St., Long Beach, Cal.

PRICED
for economy
BUILT
for long life



Illustrated is a Leland-Gifford No. 3-MVB Four Spindle Drilling Machine equipped with a Ruthman Pump.

Ruthman
GUSHER
coolant pumps

Based on performance Gusher Coolant Pumps are economical in initial price . . . economical in operation. They give split second coolant flow—use less power when throttled—require a minimum of maintenance. Pre-lubricated heavy-duty ball-bearings and an electronically balanced rotating shaft assembly guarantees long trouble-free life for your Gusher Pump. *Write for catalog today.*

THE RUTHMAN MACHINERY CO.
1818 Reading Road Cincinnati, Ohio

High-speed utility drill is especially designed and heat-treated for applications requiring a sturdier, shorter unit. Available in 3/64 through ½-in. dia; wire gage sizes, No. 1 through 60.

Chicago-Latrobe, 411 W Ontario St, Chicago 10

Liquid stripper, Strypp-Away, for removal of Epons and other chemically resistant finishes, may be used directly from container, or diluted with water. Reportedly holds up for long periods of heating without loss of strength, and may be used at temperatures as high as 220 F.

The DuBois Co, 1120 W Front St, Cincinnati 3, Ohio

Drawbar and collet sleeve attachments for use with L-W Chuck's dividing heads include one for the 11-in. models BP and AU heads; takes up to a ¾-in. round standard 2 L collet; another, for the 6½-in. model SD head, takes up to a ⅝-in. round 4 NS collet.

L-W Chuck Co, 25 S St Clair St, Toledo 4, Ohio

Ink No. 400 for wet-surface marking is applied by rubber stamp from an ordinary stamp pad to metals or other surfaces while in water or immediately after withdrawal while still wet or damp. Product water-sets without bleeding, does not etch or corrode metals. Data in Bulletin 400.

Organic Products Co, Box 428, Irving, Texas

Toggle clamps and pliers have been designed to eliminate magnetic attraction and corrosion encountered while spot welding aluminum, or working in proximity to acids. Knu-Vise Model V-400 clamp is made from non-magnetic stainless steel, and portable Knu-Vise pliers Model P-1200 are forged from non-magnetic K-Monel. Both in wide range of sizes and types.

Lapeer Mfg Co, Lapeer, Mich

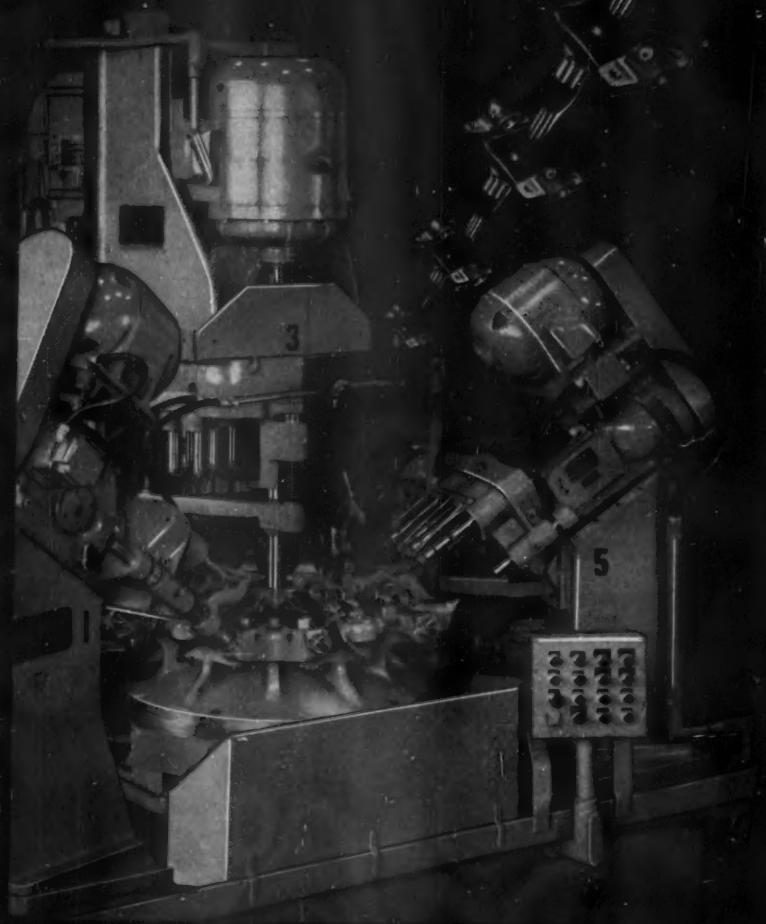
Paint stripper, non-dusting Vantrol 5610A, is said to reduce stripping time to one third. Reportedly is effective in removing heavy greases, mineral oils, and heavy sludge. Heavy-duty alkaline cleaner is non-toxic, non-flammable.

Van Straaten Chemical Co, 546 W Washington St, Chicago 2

Heavy-duty metal grid, Steel-Grid, is used to armor any industrial surface. Can be embedded in old or new floors, concrete, mastic, asphalt, or any hard-setting plastic material.

Bufnel Co, Ltd, Box 187, Hollydale (Los Angeles) Calif

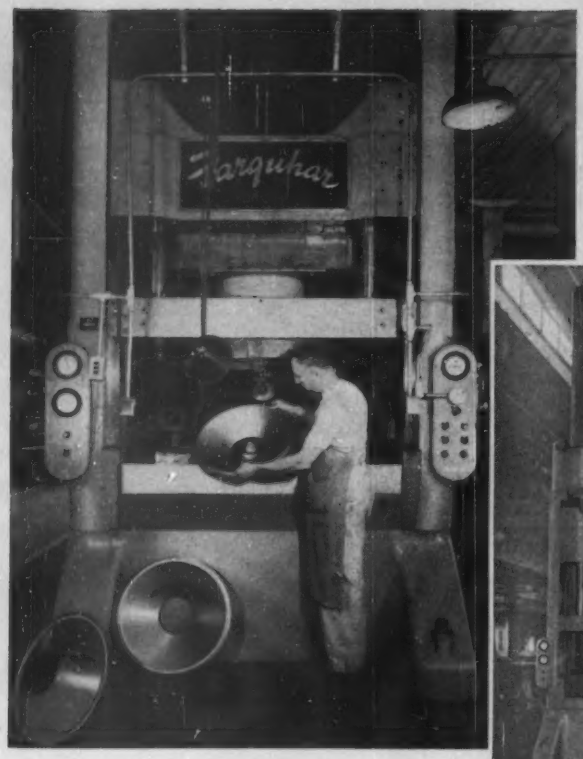
When it comes to production



AUTOMATIC DRILLING
& TAPPING MACHINES
built by Hartford Special provide maximum efficiency and economy. Write for new bulletin illustrating typical single purpose machines custom designed for high production. For the best buy in the long run consult Hartford Special — also maker of Automatic Thread Rollers and Super-Spacer, the world's finest indexing device.

come to

HARTFORD *Special*



Operator removing completed ceiling diffuser ring from Farquhar Hydraulic Press at Tuttle & Bailey, Inc., New Britain, Conn.

Tuttle & Bailey reports:

FARQUHAR HYDRAULIC PRESS Makes New Product Possible

Tuttle & Bailey, Inc., New Britain, Conn., produces heating convectors, ceiling diffusers, grilles, registers, etc., as well as several defense products for the United States. When production of the ceiling diffusers was first planned, the company found they could not be manufactured with existing equipment at their plant.

Tuttle & Bailey then consulted with various hydraulic press companies, searching for a design to meet their requirements. Finally, the A. B. Farquhar Company came up with the best design—*and at the lowest cost*—a 450-ton press with pressing ram speed of 0 to 45 in./min., approach and return speed of 390 in./min., and an operating hydraulic pressure of 2650 lbs./sq. in.

The company is very pleased with Farquhar's low maintenance cost, too. The press was installed in Aug. 1950, and has required no maintenance other than occasional gasket replacement.

Farquhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the-job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of extra-long guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

For our free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry, write to: THE OLIVER CORPORATION, A. B. FARQUHAR DIV., Hydraulic Press Dept., 1506 Duke St., York, Pa.

Farquhar
HYDRAULIC PRESSES
for Bending • Forming • Forcing • Straightening • Assembling • Drawing
Extruding • Jogging • Forging • and other Metalworking Operations

THE OLIVER CORPORATION • A. B. FARQUHAR DIVISION

Electrode, touch type, designated Speedemon No. 500, produces welds on mild, high carbon, cast steel and manganese steel. Deposition rate reportedly is over 50% greater than with conventional hard surfacing units; drag technique of application simplifies handling. Speedemon No. 12, with high iron powder content coating, has deposition rate said to be 20 to 35% higher than that produced by ordinary mild steel electrodes.

Champion Rivet Co, 10853 Harvard Ave, Cleveland 5

Titanium carbide cutting material, containing neither tungsten nor cobalt, is characterized by high wear resistance; cratering action of steel chips is said to be greatly reduced. Remains much cooler than tungsten carbide grades when cutting steel without fluids.

Firth Sterling, 3113 Forbes St, Pittsburgh 30

Electrode, Rocket No. 24, is designed for faster horizontal and downhand welding on mild and medium carbon steel. Recommened for operations requiring AWS Classes E6012 and E6020 electrodes such as machinery, low pressure storage tanks, light structural work.

Hobart Bros Co, Dept RE, Troy, Ohio

Towmotor clamp attachment, called Crate Clamp, has been developed for handling crated material. Springs, mounted along entire inner length of each arm, compress on contact to prevent damage to boxes or contents. Entire operating mechanism can be detached quickly and replaced with standard forks.

Towmotor Corp, 12226 E 152nd St, Cleveland 10

One-piece pressure foot has a diamond point rubber tip molded to a full-length threaded 5/16-in. machine screw. Adaptable for use with Wespo toggle clamps; can be used for clamping in unrestricted areas, corners, and restricted areas on aluminum and other light materials, and for pressure applications on polished surfaces.

West Point Mfg Co, 26935 W 7 Mile Rd, Detroit 19

Staco portable electric etcher has been designed for permanent marking of tools, dies, jigs, parts, materials, machinery and finished products of iron, steel, and other metal alloys. Depth of mark can be varied by use of any of four etching heats.

Standard Electrical Products Co, 2240 E Third St, Dayton, Ohio

Organic vapor respirator, Cesco No. 99, can be fitted with auxiliary cellulose filters to prevent clogging of cartridges during paint spraying operations. No tools are needed to attach or replace either filters or the 85 cc high-absorbtive-capacity, free-breathing cartridges.

Chicago Eye Shield Co, 2300 Warren Blvd, Chicago 12

Aluminum Cleaner NE-6, is stated to be mild in alkalinity, does not etch metals either at the air interface or in contact with other metals, possesses high detergency.

Enthone, Inc, 442 Elm St, New Haven, Conn

Milling cutters and end mills have been added to the Butterfield line of cutting tools.

Union Twist Drill Co, Butterfield Div, Derby Line, Vt

Phosteem process for cleaning and phosphatizing metal surfaces prior to painting is said to require minimum plant space and can be used in any convenient available section. Reportedly processes articles which previously could not be properly prepared for painting by any satisfactory method other than hand cleaning. Details in Form 55-122-015.

The Neilson Chemical Co, 6564 Benson St, Detroit

Coolant concentrate, TL-131, is claimed to have cooling power sufficient to reduce cutting temperatures 300 deg below conventional coolants. Low surface tension of wetting agents aids flow of coolant to work point, decreasing heat built-up in tools and heat check in grinding.

Johnson's Wax, Racine, Wis

Iron alloy, Tisco 150-Y an extremely hard material, has been developed to combat abrasion in its severest forms. Can be heat-treated to 700 Brinell.

Taylor-Wharton Iron and Steel Co, High Bridge, NJ

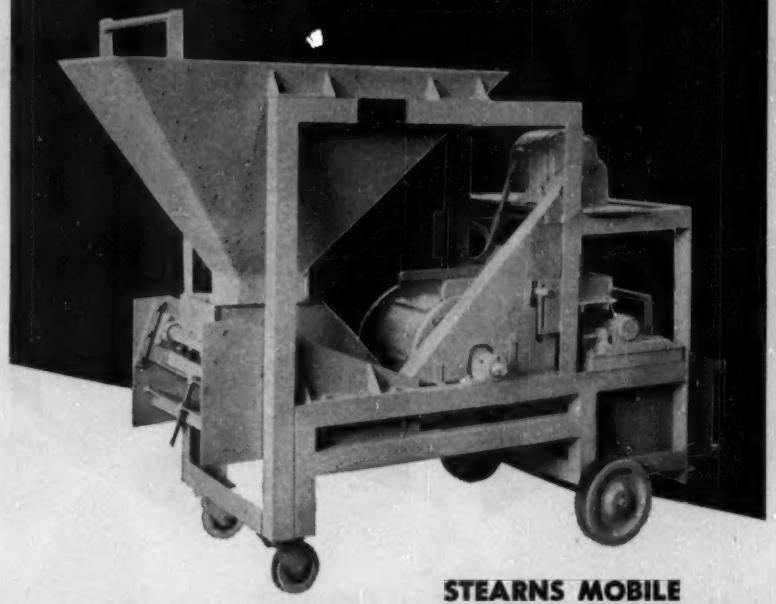
Gear inspection calculator determines relationship between tooth thickness and radial displacement and total composite error for pressure angles of 30, 20 and 14½° when gear is inspected on a gear rolling fixture.

Dexter Machine Products, 20451 U S 12 West, Chelsea, Mich

Vinyl coating for paint spray booths, called White Vincote, is sprayed on wall surfaces and can be peeled off quickly and easily. Color permits high light reflectivity.

Detrex Corp, Detroit 32

Separates 7 cu. ft. of parts and tumbling chips in just 10 minutes



STEARNS MOBILE MAGNETIC PARTS SEPARATOR

You can separate steel parts from deburring chips in minutes instead of hours with a Stearns Magnetic Parts Separator. As mixture cascades from feeder, the powerful Stearns drum-type magnet lifts parts to belt which conveys them to demagnetizer. Non-magnetic chips fall into suitable receptacle for re-use.

Make these Stearns advantages work for you!

Big Labor Saver — No hand picking or screening. No attention required while unit is operating.

Non-Choking Adjustable Feeder — Regulates flow of material . . . handles parts of various sizes and shapes.

Positive Separation — Lift principle pulls steel parts up and out of chips or deburring compound . . . eliminates entrapment of parts.

No Magnet Operating Expense — Permanent, powerful Alnico V magnet needs no current.

Completely Self-Contained Mobile Unit — No separate feeders, chutes, hoppers. Just connect drive motor to current and you're ready to operate. Mounted on wheels for easy movement around plant.

Protection for Parts — Hopper and feeder are rubber-lined.

Parts Fully Demagnetized.

Find out how a Stearns Parts Separator cuts handling costs. Write today for Bulletin 110.

1089

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

STEARNS MAGNETIC, INC., 700 S. 28th St., Milwaukee 46, Wis.

Here are GAGE BLOCKS that invite your most critical inspection!

WE'RE "fussy" about the gage blocks we make. And we hope, when *you* buy a set, that you'll be fussy, too. Because only by your own critical, impartial inspection of each individual block can you come to appreciate the true full measure of quality, value, and dependability inherent in Ellstrom Chromium Plated Standards.

Yes, we'd like you to check any set of Ellstrom gage blocks that meets your particular inspection or production requirements. Check them block-by-block for size . . . for their consistent adherence to closer than specified accuracy. For flatness . . . parallelism . . . and the finish of their hard, uniform chromium plated gaging surfaces that give you greater serviceability, longer wearing millionths. And, too, test the fine materials used in their manufacture . . . for coefficient of expansion and controlled metallurgical stability. Then, we're sure, you'll agree that it pays to standardize on Ellstrom Standards.

IF YOU BUY GAGE BLOCKS, send for your free copy of this new Ellstrom Standards Catalog. Contains complete specifications and prices on the entire Ellstrom line of gage block sets, accessories, individual blocks, wear blocks, inspection service and trade-in plan. Write today!

ELLSTROM STANDARDS DIVISION
Dearborn Gage Company • 22035 Beech Street • Dearborn, Michigan
Originators of Chromium Plated Gage Blocks

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Laminated plastic called Gravoflex has been developed for engraving with any pantograph machine. Material is flexible, scratch-proof, can be bent by hand to any shape. Can be nailed without pre-drilling, also stitched or stapled. Available in sheets, strips, or cut nameplates in various thicknesses: 1/32, 1/16, or ⅛ in.

Hermes Plastica, 13-19 University Place, New York 3

Soft jaw for chucks, called Perma Jaw, is equipped to take expendable inserts which can be tooled to fit any job. When insert is ground down, it can be replaced with new one. Standard model takes one insert, deluxe model takes two; extra length inserts convert small chuck to larger capacity.

A&A Co, 1133 South Ave, Plainfield, NJ

Abrasive sticks and blocks are available in 22 sizes in rectangular, square, cylindrical, and triangular shapes ranging from 3 to 8 in. long. For use dry or with water, for finishing, polishing, removing rust, deburring, sharpening tools and honing. Can be cut and shaped with knife or tool to fit irregular or curved surfaces.

Sandusky Abrasive Wheel Co, 636 W Ransom St, Kalamazoo, Mich

Aluminum cleaner, Acid Solvent Emulsion No. 1, reportedly completely removes soil from fabricated parts prior to any type of final finishing. Product is non-corrosive, non-toxic, and readily emulsifiable.

Northwest Chemical Co, 9310 Roselawn, Detroit 4

Slide rule, 903-T single-setting conversion model, has 64 linear liquid, energy, and miscellaneous factors on one side, plus complete trig scale arrangement on reverse. By positioning conversion mark opposite index mark, any conversion is automatically set and read without moving slider or further computation.

Pickett & Eckel 1109 S Fremont St, Alhambra, Calif

Mill-hardened beryllium copper, called Penntemp, requires no heat-treatment, is available in strip form. Thicknesses run from 0.001 to 0.025 in., with minimum tolerances ranging from ± 0.0001 to ± 0.0004 in., depending upon thickness. On widths from ⅛ to 5 in., tolerances of ± 0.001 and ±0.002 are regularly held. Furnished in five tempers, each offering a different combination of strength and formability.

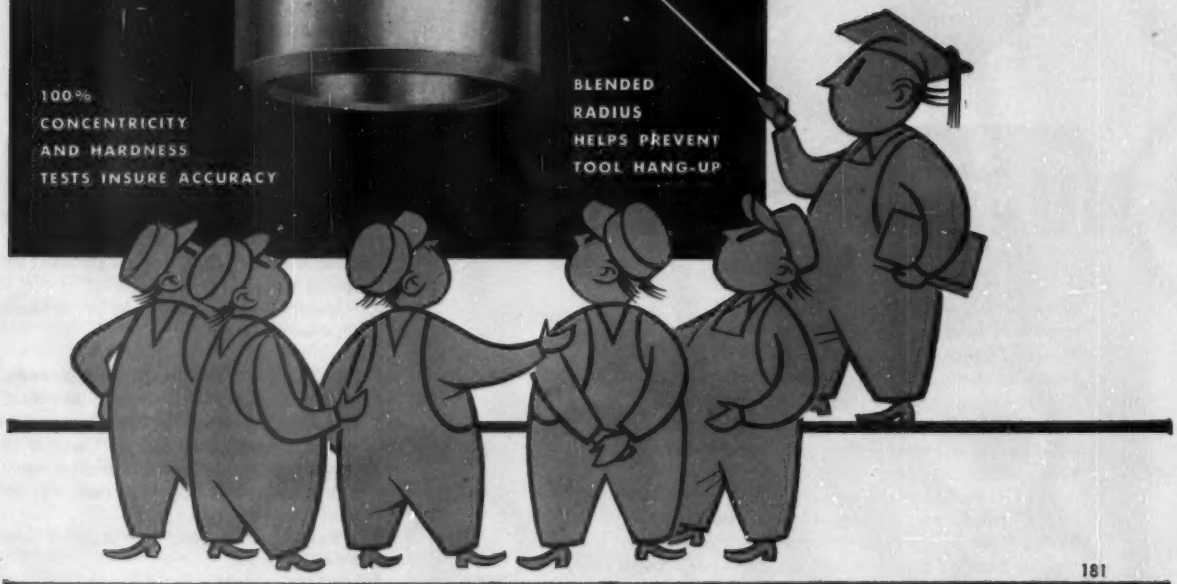
Penn Precision Products, 501 Crescent Ave, Reading, Pa

UNIVERSAL DRILL BUSHINGS

INSURE PERFECT ALIGNMENT AND LONG LIFE OF PRODUCTION TOOLS

KNURLED HEADS PROVIDE GOOD GRIP
SUPERFINISH BORES REDUCE TOOL WEAR
100% CONCENTRICITY AND HARDNESS TESTS INSURE ACCURACY
BLENDED RADIUS HELPS PREVENT TOOL HANG-UP

Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.



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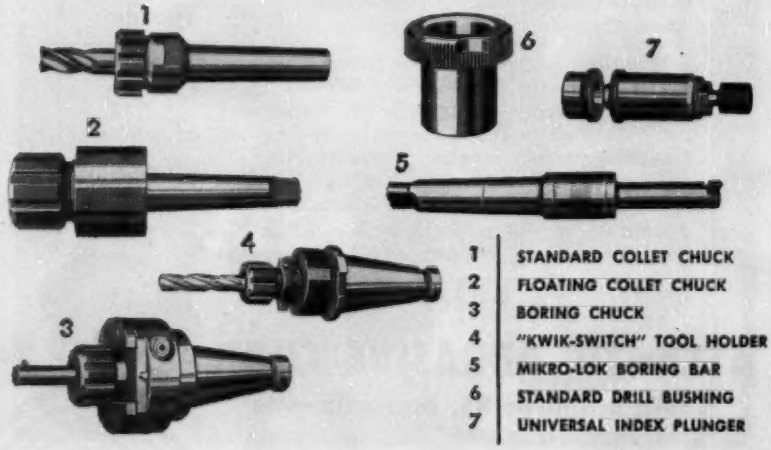
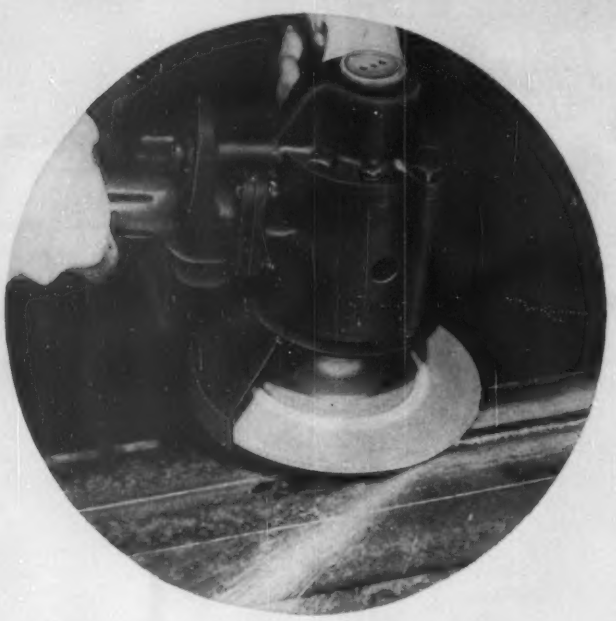
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 1
MICHIGAN



1	STANDARD COLLET CHUCK
2	FLOATING COLLET CHUCK
3	BORING CHUCK
4	"KWIK-SWITCH" TOOL HOLDER
5	MIKRO-LOK BORING BAR
6	STANDARD DRILL BUSHING
7	UNIVERSAL INDEX PLUNGER

Smooth operation:

WELD GRINDING with



NU-TEX *DEPRESSED CENTER* **WHEELS**

Undercutting and reducing heavy welds is a smoother, faster, safer operation when you use Nu-Tex Depressed Center Disk Wheels. *Smoother* because Nu-Tex Wheels are designed with a built-in resiliency to reduce bouncing to a minimum, assure a steady, cushion-like grinding action. *Faster* because their cushioned cutting action distributes pressure evenly over grinding areas . . . makes every inch of surface travel an inch of productive cutting, whether you use portable or bench-type grinders. *Safer* because they're bonded together with an extremely tough resin for maximum durability . . . textile-reinforced to assure greater protection against breakage, longer life under continuous operation.

Why don't you investigate the time and money-saving advantages of Nu-Tex Disk Wheels? Straight and depressed center Nu-Tex Wheels are available in all popular diameters and thicknesses for cutting, slotting, roughing, smoothing, grinding or polishing. Grades range from 0 (hard) to 6 (soft). Write now for complete details. Atlantic Abrasive Corp., 516 Pearl St., South Braintree 85, Massachusetts.

Specify **NU-TEX** *for 360° of wheel efficiency!*

ATLANTIC ABRASIVE CORP.

South Braintree 85, Massachusetts

Oakite Rustripper is for alkaline derusting of precision parts where dimensional change and acid embrittlement must be avoided. Heavy-duty, off-white powder may be used in hot or cold solutions; may also be used with direct current to remove deep-pitted rust, reverse current to remove heat scale.

Oakite Products, Inc, 124 Rector St, New York 6

Hydraulic scissors jack has been tested for 5000 lb., with rated capacity of 1½ tons. Portable, frame-design unit has safety overload valve and reportedly requires no field maintenance.

Hydraulic Frame Jack Co, 8111 S Western Ave, Los Angeles, Calif

Pre-phosphating metal cleaner for use in mechanical spray processing equipment contains no metallic activator. Detrex 771 Paintbond leaves metal surface chemically clean and requires no surface heating in pre-phosphate coating stages.

Detrex Corp, Detroit 32

Super high speed end mills, called Blackhawk, are for use on tough alloy steels and abrasive ferrous and non-ferrous materials. Mills have hardness of 66 to 67 Rockwell C without being overly brittle. Made in standard or special sizes; single or double end with 2, 3, or 4 straight or spiral flutes.

Metal Removal Co, 1546 N Orleans St, Chicago 10

Dry-tumble finishing compounds, designated Tumb-L-Grayn, are said to produce unusually high luster finish on small metal parts. Consist of treated granules, obtainable in various sizes, which separate easily from parts without dust.

Tumb-L-Matic, Inc, 4510 Bullard Ave, New York 70

Carbide reamers in a complete size range are available in rough ground, semi-finished stage. Cutters are delivered with adequate grinding stock so that a ½-in. nominal size may be ground 0.490 to 0.516 in., and a 1-in. nominal size may be ground 0.990 to 1.020 in.

Super Tool Co, 21650 Hoover Rd, Detroit 13

Nylon hammer-head cap fits all standard ball peen and claw hammers, said to eliminate rebound, handle-vibration, and sting. SP-8 is for 8-oz hammers and SP-16 for 16-oz; three additional sizes fit standard 4-6, 12, and 24-oz tools.

Lempco Automotive Inc, Cleveland 27

Lubricant, designated Moly-Spray-Kote, is applied to metal surfaces by spraying from a self-pressurized, aerosol container. Product is non-flammable and may be used on hot surfaces; is non-corrosive, non-toxic, and does not contain a resin binder.

The Alpha Corp, 179 Hamilton Ave, Greenwich, Conn

Welders' goggles made of lightweight plastic with an ultra-violet ray inhibitor overcome fogging, crazing, and brittleness. CESCO No. 548-G have round rubber headband and No. 549-G have flat elastic or rubber headband. Can be worn over personal glasses.

Chicago Eye Shield Co, 2300 W Warren Blvd, Chicago 12

Carbide burs, tradenamed Starbide, have superfinished cutting edges; peaks on edges are so small that normal cutting shock reportedly will not break them. Available in 12 styles in ⅛-in. shank, and 12 styles in small diameters with 3/32-in. shank.

Starlite Industries, 58th at Market St, Philadelphia 39

Check valve, available in 1½ and 2-in. sizes, has circle seal design for operation with low pressure drop and no leakage. In systems such as oxygen/propane or oxygen/acetylene, units prevent unintentional mixing of gases in supply hose. Safety is also reportedly assured in the operation of air-actuated devices in event of failure or reduction of air or vacuum supply. Available in all sizes in either brass, aluminum, or steel.

James-Pond-Clark, 2181 East Foothill Blvd, Pasadena 8, Calif

Lubricant, called Red Sawlube, for saws and metal cutting tools, is available in bar form. Long-life protective film keeps tools cooler, reduces oxidation. Minimum build-up minimizes possibilities of throwing tools off balance when operating at high speeds.

Original Bradford Soap Works Inc, West Warwick, RI

Motor protector added to Mini-Breaker line fits branch circuits of corresponding 4, 4½, 5, 5½, 6, and 7½-amp ratings, as secondary protection for motors, and appliances. Safely interrupts excessive overloads and short circuits; trips instantly on shorts, but has a built-in time lag to handle temporary starting loads and line surges.

Mechanical Products, 1800 River St, Jackson, Mich

BE *Sure* YOUR NEW ENGINE LATHE CAN *Take* IT!

The engine lathe you buy today could be the one you will call upon for 'round-the-clock production. Make sure, before you buy, that the lathe of your choice can take such punishment.

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(3) That the "back gear" is in front of the spindle, exerting its powerful downward thrust to offset the lifting action of the tool when heavy cuts are made.

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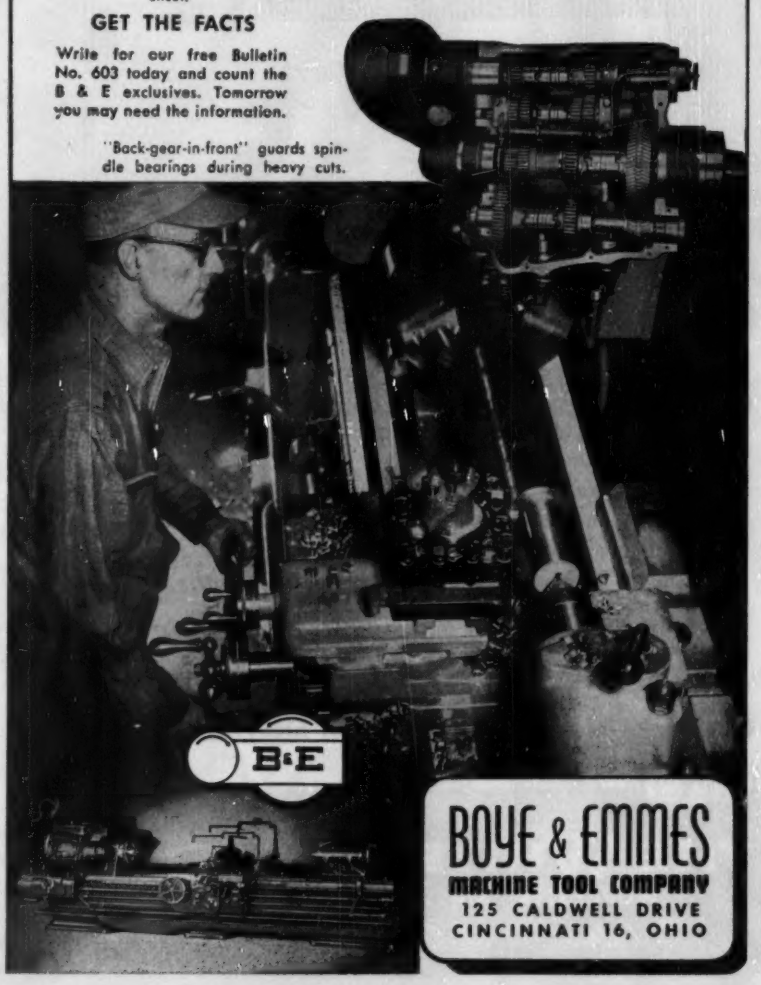
"Back-gear-in-front" guards spindle bearings during heavy cuts.



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Steel stands for black granite surface plates, range in size from 12x18 in., through 72x144 in. Rigidly constructed of heavy-gage angle iron reinforced to withstand from 3 to 6 times weight of plates. Over-all working height is 36 in.

Collins Microflat Co, 2326 E 8th St, Los Angeles 21, Calif

Leak-Tec liquid detects minute leaks of gases, oils, air. Applied to the surface or item to be tested by squeezing plastic container equipped with dispenser. In addition to maintenance use, non-flammable, non-explosive, non-toxic product can be used for inspection purposes on finshed products and delicate instruments on assembly line.

American Gas & Chemicals, 45 Rockefeller Plaza, New York 20

Elastic compound tape, No. 162, is extruded with reinforcement core of tobacco cloth, will not flow out when seams are bolted or riveted. Odorless, tacky sealer, is said to have excellent water and moisture resistance, is unaffected by temperatures through –30 to 180F.

Presstite Engineering Co, 3798 Chouteau Ave, St Louis 10, Mo

Machine key stock, designated Mak-A-Key, is available in 12-in. lengths in six sizes; 3/16, ¼, 5/16, ⅜, 7/16, and ½-in. squares. Micrometer reading of this zinc-coated material is oversize on both dimensions.

DeVan-Johnson Co, Dept A, 500 Rathbone Ave, Aurora, Ill

Phosphatizing compound, Fosbond 61, for use on zinc surfaces, may also be used on steel. Provides a fine crystalline coating which serves as base for subsequent painting operations. Mixed with water, applied by spraying.

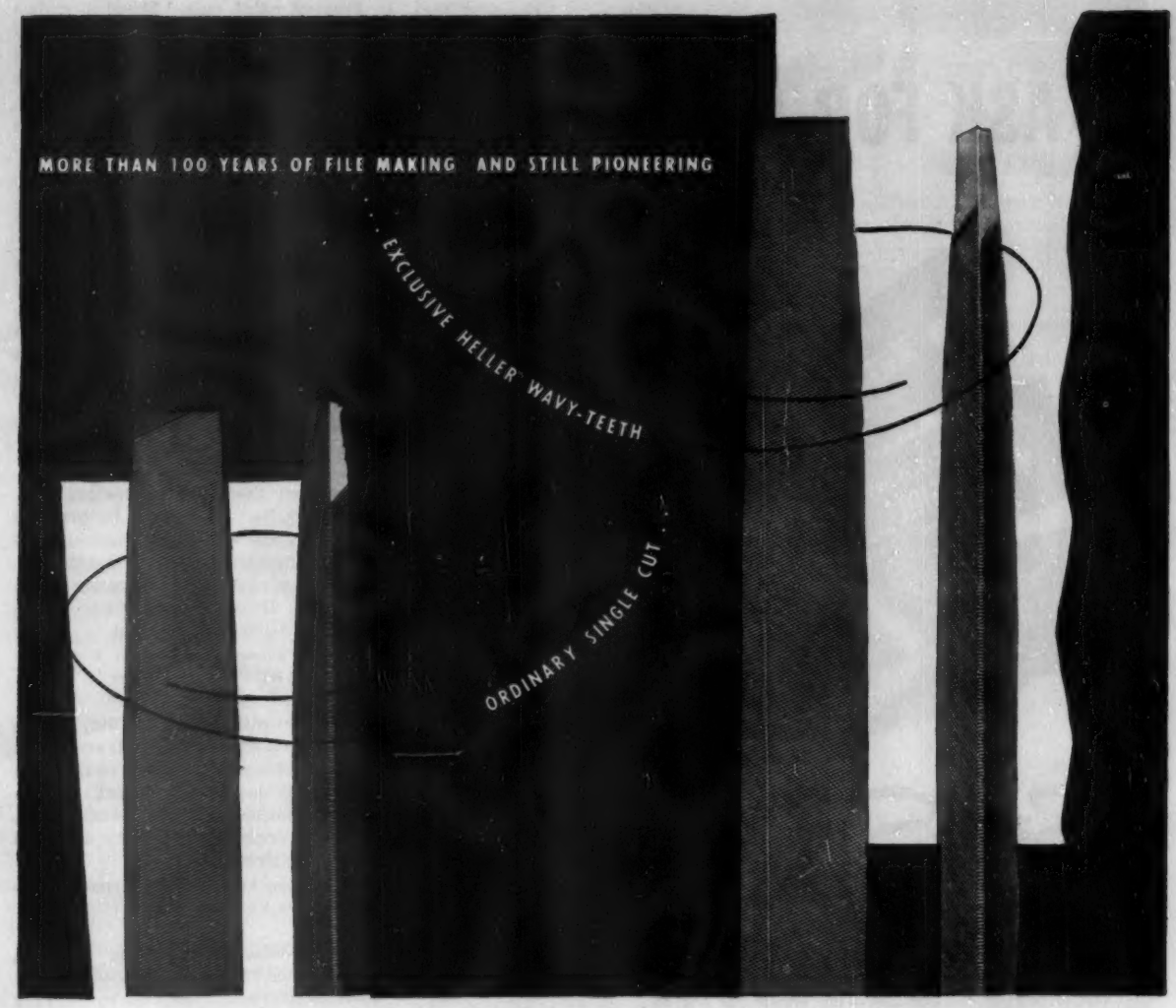
Pennsylvania Salt Mfg Co, 1000 Widener Bldg, Philadelphia 7

Torque thumbscrews available in 4 styles and 21 sizes can be disassembled by removing snap ring to clean area retaining ball and spring, which govern torque action of unit. Elimination of washer before head of screw permits use of pliers or wrench for desired adjustment.

Siewek Tool Co, 2862 E Grand Blvd, Detroit 2

Flooring material, designated Stoncap, supplied in ¼-in. depth, smooths out worn, rutted surfaces, wood, concrete or composition. No primer is needed; non-skid, fire-resistant material available in marine, green and gunmetal.

Stonhard Co, 601 Stonhard Bldg, 1306 Spring Garden St, Philadelphia 23



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ATKINS Silver Steel SAWS
BW

Stop-off paint, called Metal Stop, has a distinct gray-white color which shows up part area to be protected in metallizing. Edge lining is reportedly very sharp; is fast drying, has free-flowing characteristics, is water-soluble, and leaves no streaks or unprotected areas.

Park Chemical Co, 8074 Military Ave, Detroit

Elastic compound tape No. 163 has high compressibility for sealing small gage metal seams, and is available in 1/32-in. thickness and widths from ½-in. to 2-in. Moldable sealer is extruded in beads or tapes around a light tobacco cloth core.

Presstite Engineering Co, 3798 Chouteau Ave, St Louis 10, Mo

Neoprene maintenance coating, Magic-Vulc No. 245-B, may be brushed or sprayed on most surfaces, requires neither primer nor accelerator, is ready to use directly from the can. Dries in two hours; coverage is 75-100 sq ft per gal.

Magic Chemical Co, Dept N 199, 121 Crescent St, Brookton, Mass

Peelable protective coating, Strip-Kote, imparts a tough transparent film to prevent scratching or marring of highly polished surfaces. Quick-drying liquid may be brushed on, dipped or sprayed; easily stripped when desired.

Adhesive Products Corp, 1660 Boone Ave, New York 60

Rubber-bonded polishing wheels, designated SAWCO, can give a number of degrees of finishes by varying pressure between work and wheel. May be cut to polish grooves, flutes of taps and drills, corners. Available in diameters from 1 to 10 in., with face thicknesses from ¼ to 1 in.

Sandusky Abrasive Wheel Co, 623 W Ranson St, Kalamazoo, Mich

Push-type cranes are available in light-duty model in five different capacities and heavy-duty model in seven capacities. Can be furnished in various spans, equipped with hand-operated or electric hoists.

Industrial Crane & Hoist Corp, 315 N Ada St, Chicago 7

Tapping screws with two balanced cutting edges, wider flutes, greater material strength, vibration protection, are available in three types: G2, for use in steels, alloy steels, and cast iron; G3 for die-casting; H3 for low-driving torque with high stripping torque for tighter fastening.

Continental Screw Co, New Bedford, Mass

Titanium high-strength alloy, Rem-Cru A-110AT, is now available in sheet form in thicknesses down to 0.025 in. High-strength product is readily welded with the same techniques used for commercially pure titanium; ductility of fusion welded joints has been reported to be excellent. Grade has minimum tensile strength at room temperature of 115,000 psi.

Rem-Cru Titanium, Henry W Oliver Bldg, Pittsburgh 22

Special forks, hydraulically adjustable from side to side, have been assigned to speed handling when a great variety of different widths of pallet loads must be handled. Recommended for operations where a Towmotor must be used alternately as a clamp and fork truck, attachment bolts directly onto support plates of standard clamp-operating mechanism, permitting quick removal.

Towmotor Corp, 1226 E 152nd St,

Self-locking nuts, consisting of one-piece nut and lock washer combination, are hardened steel throughout. Serrated teeth on face of nut provide positive locking action; all-metal construction makes them immune to effects of oil or water. Available in all machine screw sizes.

Jacobson Mfg Co, Kenilworth, NJ

External solder fluxes, ranging from mild non-corrosive rosin type to strong, highly-active stainless steel type, are said to give maximum wetting, rapid fluxing power, and minimum corrosive after-effects.

Alpha Metals, 56 Water Street, Jersey City 4, NJ

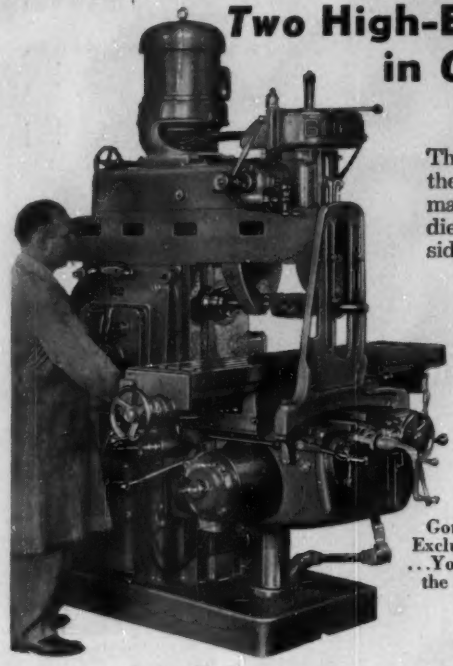
Large-bore clutches in sizes up to 12 in. are available for over-running, indexing and backstopping. Provide maximum torque capacity for size and weight and instantaneous engagement, without head shaft wind-up.

Formsprag Co, 23601 Hoover Rd, Van Dyke, Mich

Nut, designated Quintlock, bites into surface of sheet metal, forming a permanent torque-resistant thread in the sheet, receives machine screws without need to be held by fingers or wrench. Fasteners have been tested to resist screw torque up to 87 in.-lb.

Fox Products Co, 4720 N 18th St, Philadelphia 41

New Gorton 2-28 Brings You *Two* High-Efficiency Mills in *One* Money-Saving Unit



. . . as a horizontal mill.

The Gorton Receptor Ram makes the new 2-28 a true multi-purpose machine . . . "tailor-made" for *all* die-mold-machine shops. Consider the facts:

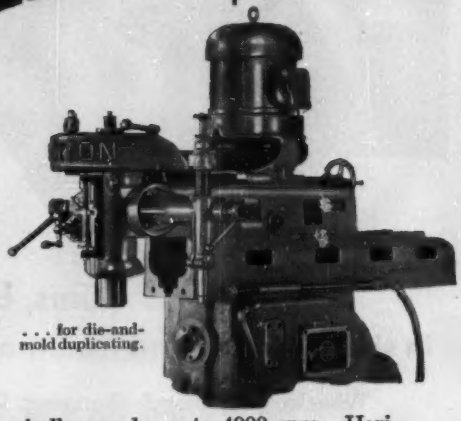
Gorton Exclusives . . . Yours in the 2-28

HORIZONTAL MILL

VERTICAL MILL (Super-speed)

DUPLICATOR (Simply add a duplicator head and a duplicator table.)

NOTE: You can switch from horizontal to vertical high-speed milling in 5 minutes or less. Save space and capital equipment — and increase production facilities at the same time.



. . . for die-and-mold duplicating.

- Fullwidth knee, 24½ inches wide, provides extreme rigidity. Even under heavy cutting loads, there's no sag or twist.
- New lubrication system dissipates heat to prevent spindle "growth" . . . to promote full use of spindle horsepower . . . to end the necessity for adjusting cutter depth to compensate for differences between "hot" and "cold" operation.
- High-speed head delivers spindle speeds up to 4000 rpm. Horizontal spindle: up to 2000 rpm — 7½, 10 or 10/5 hp *at spindle nose.*
- Double-extension feature of the Receptor Ram greatly increases work area, vertical capacity and transverse cutting capacity on either the Gorton 2-28 or 3-34 Horizontals.
- Down time and maintenance are drastically reduced by *true* unit construction features. A removable coolant pan speeds sump cleaning and coolant changing.
- Overload protection automatically safeguards expensive cutters. A horsepower-load meter constantly indicates cutter condition and operating efficiency.
- Full directional front and rear controls are interlocked.

You can't afford to overlook this Gorton Horizontal with Receptor Ram. It could produce more profit per dollar invested than any other machine you have. Fill out and mail the coupon.

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Please send at once Bulletin 1655- 1512 and data on Gorton Horizontals.

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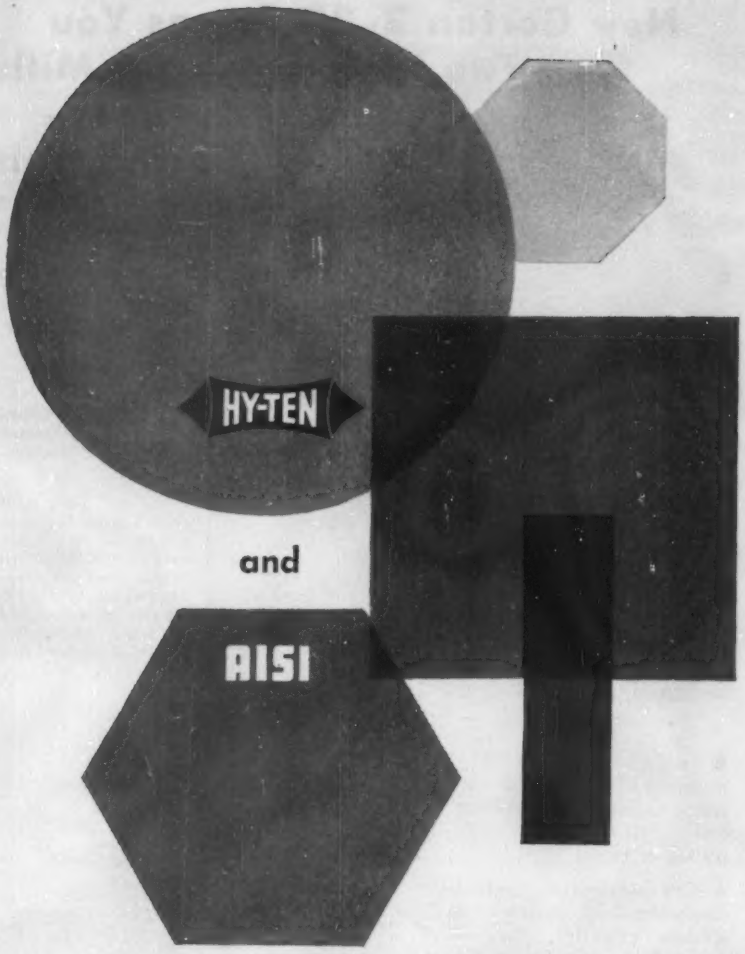

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New Books...

1955 MECHANICAL CATALOG — *Published by American Society of Mechanical Engineers, 29 W 39th St, New York 18. 679 pages, 11½x8½x2⅝ in. Free to ASME members on request.*

There are 356 pages of manufacturers' catalogs, specification sheets, and advertising pages, 20 pages of descriptions of ASME publications, and a comprehensive directory with over 40,000 listings of 6500 products in this latest mechanical catalog. Such products as gears, pumps, steels, furnaces, bearings, and bolts are described.

Quality of presentation varies throughout the catalog, as could be expected from a gathering of advertising material, but the catalogs are well indexed, and the book makes a fine "where-to-buy-it" reference for mechanical parts.

•

THE LIGHT METALS HANDBOOK — *Edited by George A Pagonis, Light Metals Research Laboratory. Published by D Van Nostrand Co, Inc, 250 Fourth Ave, New York, NY. Vol 1, text, 199 pages; Vol II, tables, 185 pages. Price $8.50*

The increasing application of the light metals, aluminum and magnesium, has accentuated the need for an adequate handbook dealing with these materials. The general handbooks available tend to be skimpy in their treatment of the light metals.

This handbook is prepared from the metallurgist's viewpoint rather than the production man's viewpoint. The coverage of the basic compositions, characteristics, and properties of the alloys is thorough and virtually all of the 138 tables deal with these subjects.

Working of these materials is not covered thoroughly, being limited to brief, general discussions of their characteristics. The handbook should be useful for metallurgists and designers, but would appear to have limited value as a production reference.

•

HANDBOOK OF INDUSTRIAL SAFETY STANDARDS, 9TH EDITION — *Published by Association of Casualty and Surety Companies, 60 John St, New York 38, NY. 315 pages. Price $1.40.*

This handbook, which first appeared more than 30 years ago, has been

Now's the time to discard
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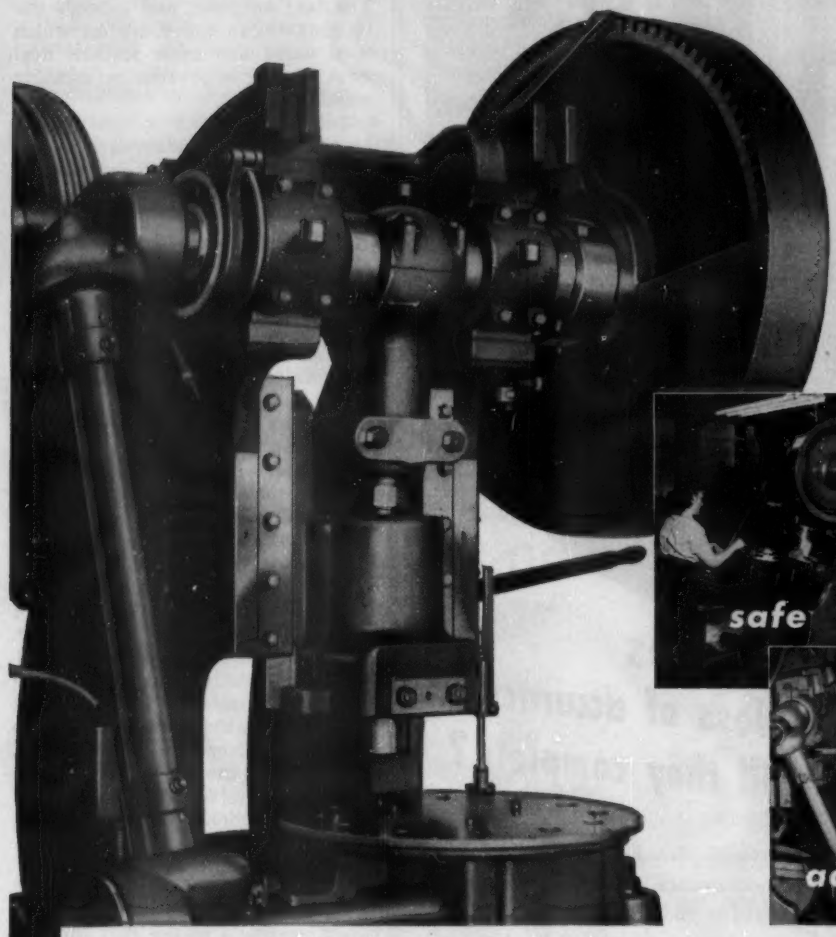

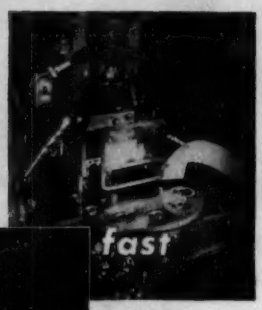

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This outstanding record is made possible by Ames' use of simple basic design, highest quality materials, rugged construction . . . and expert craftsmanship.

How many more cycles will these Ames indicators complete?

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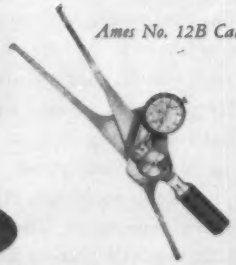

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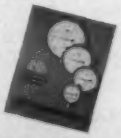

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enlarged 50% over the 8th Edition. It compiles the industrial safety requirements of such organizations as ASA, ASME, National Fire Protection Assn, and government agencies. The text amplifies and extends the information in the codes on which it is based and some sections deal with topics not covered by existing standards.

Subjects covered include safety programs, accident investigation, materials handling, boilers and unfired pressure vessels, machine guarding, illumination, exhaust systems, electrical equipment, spray coating, tank operations, building exits, and prevention of off-the-job accidents. Chapters have been added on welding and cutting, storage and handling of flammable liquids, radiation hazards, and disaster control.

•

INDUSTRIAL RELATIONS AND THE GOVERNMENT—*By Wayne L McNaughton, associate professor of personnel management and industrial relations; and Joseph Lazar, lecturer in business law, UCLA. Published by the McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 531 pages, 6 x 9 in. Price, $6.*

This is primarily a textbook-history of labor-management relations and how and why the government had to take such a large part in the scene.

Because of the subject matter, the main audience for the book should be among students, who will be able to get a broad view of the development of labor laws and customs.

The viewpoint of the authors is, with a few exceptions, quite "liberal", which is to say that in most cases their sympathies seem to lie with labor. For example, in the chapter which describes the Taft-Hartley law, the provisions of the law are given in detail. But after each section of law there is a "critique" which tells why that section of the law is distasteful, unliked by labor, likely to lead to abuses by management, and so on. This seems a little biased in favor of labor, unless the authors take the view that the law stands by itself and needs no justification. The fierce, and often unfounded, attacks on the Taft-Hartley law by organized labor spokesmen make this view untenable. A little explaining by the authors about why the Taft-Hartley law contained the provisions it did would have made a better balance and supported the book-jacket's contention that this is an objective and impartial treatment of the subject at hand.

COMPRESSED AIR HANDBOOK (Second Edition)—*By Compressed Air & Gas Institute. Published by McGraw-Hill Publishing Co, 330 W 42nd St, New York 36. 384 pages. Price, $8.*

Late information on centrifugal compressors and displacement compressors, new maintenance techniques, and a large number of illustrations and charts have been added to the second edition of this standard work on uses and tools for compressed air.

Being an official publication of the Compressed Air & Gas Institute, the book can be treated as a solid authority on the field of air power. It includes considerable data on air tools, compressors and air systems, and on engineering facts useful to the engineer or plant maintenance man.

The six sections of the book (they are longer than chapters) cover:

Applications
Portable and rock tools
Systems
Positive-displacement compressors
Dynamic blowers and compressors
Air-engineering data

The text is well indexed for reference, rather dully illustrated, but strong in tabular data and maintenance procedures.

•

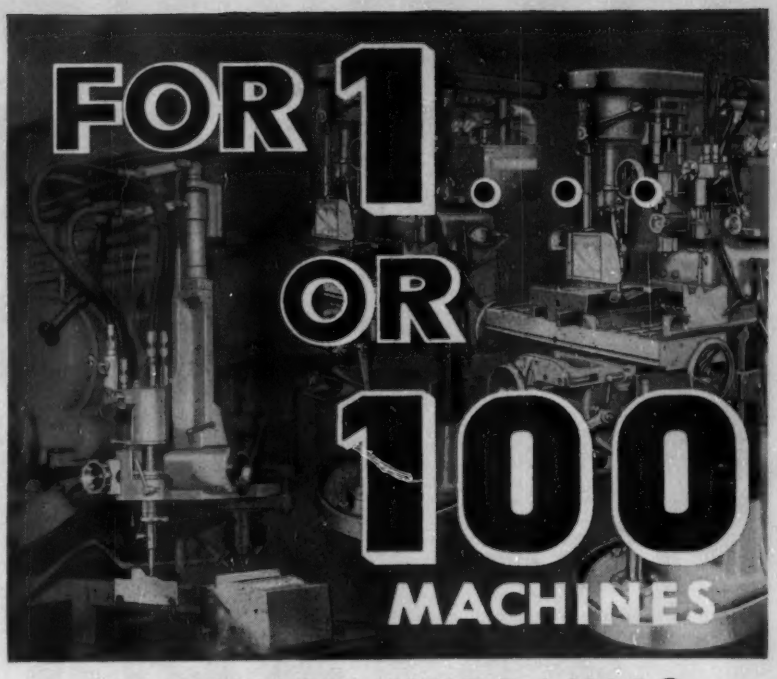
ACCIDENT FACTS, 1954 EDITION—*Published by National Safety Council, 425 N Michigan Ave, Chicago 11, Ill. 96 pages. Price 75¢.*

This statistical yearbook of the National Safety Council contains facts and figures on all types of accidents. Twenty pages are devoted to occupational accidents. There is a detailed list of accident rates by major industry groups, as well as charts showing the accident trend during the past 25 years. Most common source of injuries, part of body most frequently injured, off-the-job accident problems, unsafe acts and unsafe conditions contributing to permanent injury and death are covered.

•

LA MACHINE-OUTIL (THE MACHINE TOOL). VOLS 2, 3, AND 6. *Published under the direction of A R Metral, president of the syndicate of mechanical and metalworking industries, by Dunod, 92 Rue Bonaparte, Paris, France. Vol 2, 372 pages; Vol 3, 432 pages; Vol 6, 168 pages. 8x11 in.*

The first two volumes of this series, Vol 1 and 4, have already been reviewed (*AM*—Oct 12 '53, p323) and the general purpose of the series



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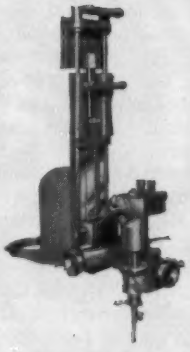

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explained. In addition to the three reviewed below, three additional volumes are still to appear.

Vol 2 deals with lathes of all types and is divided into six sections: engine lathes and special lathes derived from them; semi-automatic lathes; automatic lathes; multiple-tool lathes; copying lathes; and vertical lathes. The first section covers normal operations performed on the engine lathe in single pieces or in small lots; medium and large production on special engine lathes; special operations on engine lathes (milling, grinding, etc); and special lathes developed from the engine lathe, such as tube lathes, piston-turning lathes, and similar special types.

Section 2, semi-automatics, explains the principles of operation, shows the various components, accessories, and toolholders, and gives examples of various operations performed. Similar information is presented in Section 3 on automatics, and in Section 4 on multi-tool lathes.

Section 5 discusses copying lathes and considers the various systems employed, the limitations of copying lathes, and the accuracy and speed of response obtainable. Section 6, vertical lathes, deals with the construction, drives, and controls of different types of vertical lathes of French, American, German, and other manufacture.

Volume 3 is devoted to "Machining by Rotating Tools," and deals with drillpresses of all types, horizontal boring, drilling and milling machines, horizontal and vertical milling machines, unit heads and their application, transfer machines, and jig borers and grinders. Each chapter discusses the machines in detail, shows for what purpose they are used, and gives specific examples of machine application. Also dealt with are such important matters as the cutting tools employed and the manner of holding tools and work.

Volume 6, abrasive machining, concerns abrasive wheels, diamond wheel dressing, various types of grinders, honing and honing machines, and machines and methods for tool sharpening.

It is to be regretted that space does not permit a more detailed review of the contents of these invaluable volumes, and still more regrettable that they are not available in the English language. Nevertheless, anyone with a working knowledge of French should have little difficulty in understanding the greater part of the contents, as they are well illustrated and written in an easy-to-follow style.

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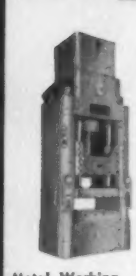
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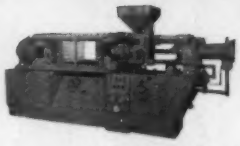
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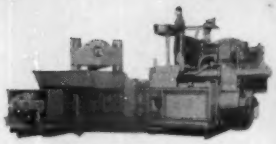
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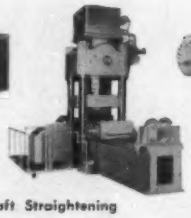
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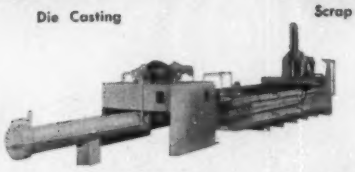
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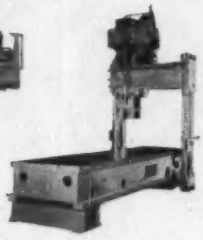
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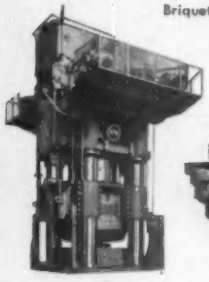
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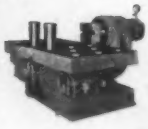
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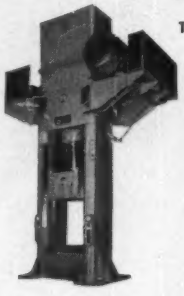
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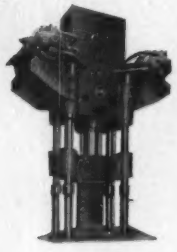
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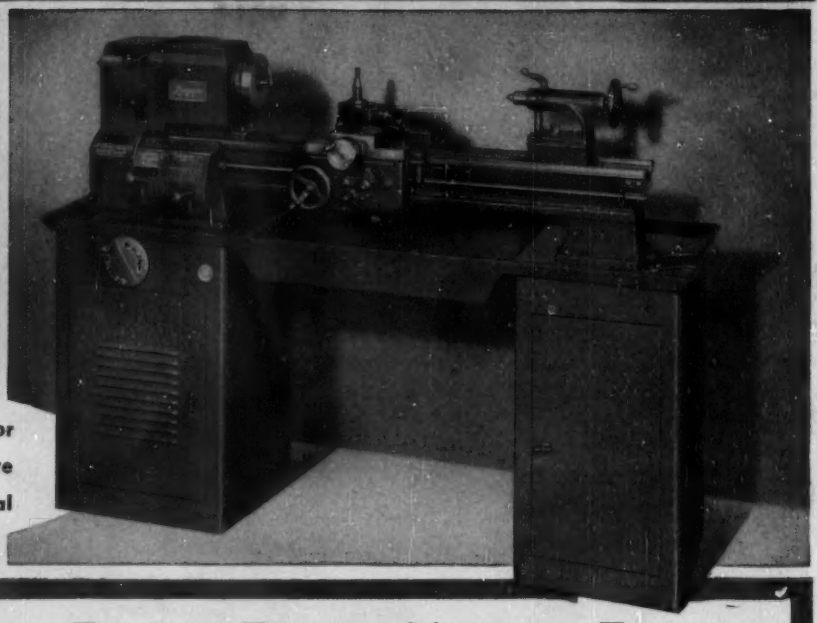

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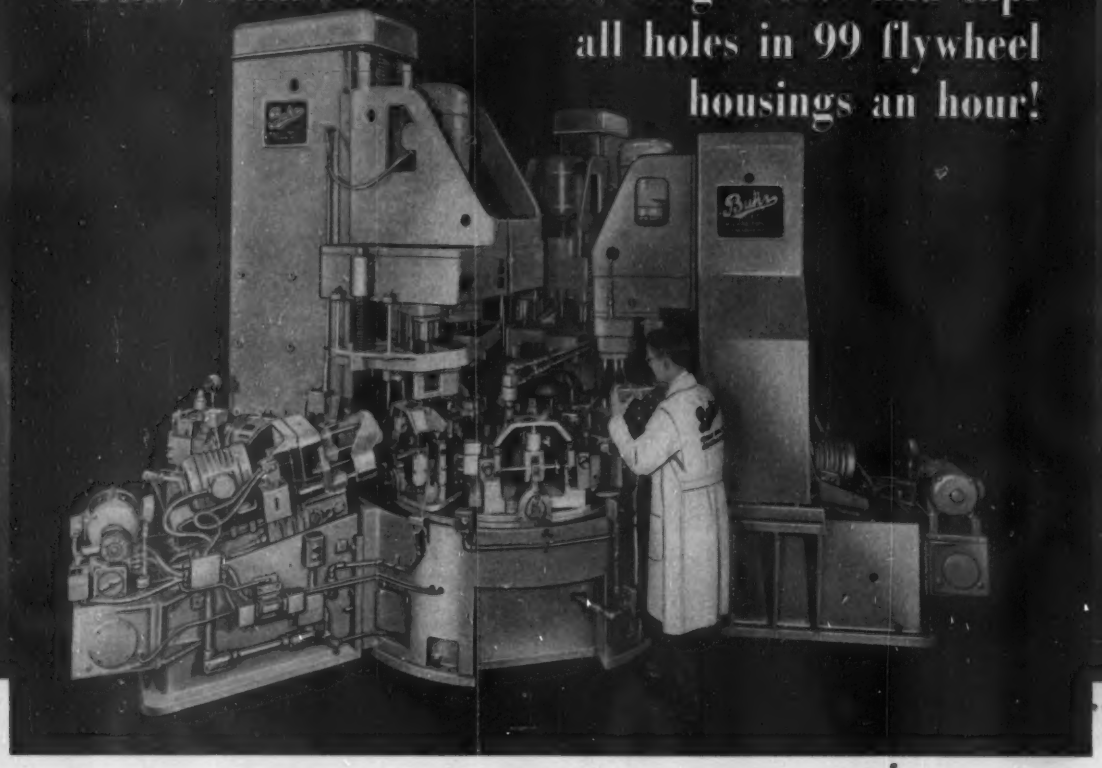

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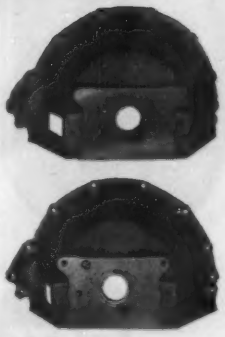

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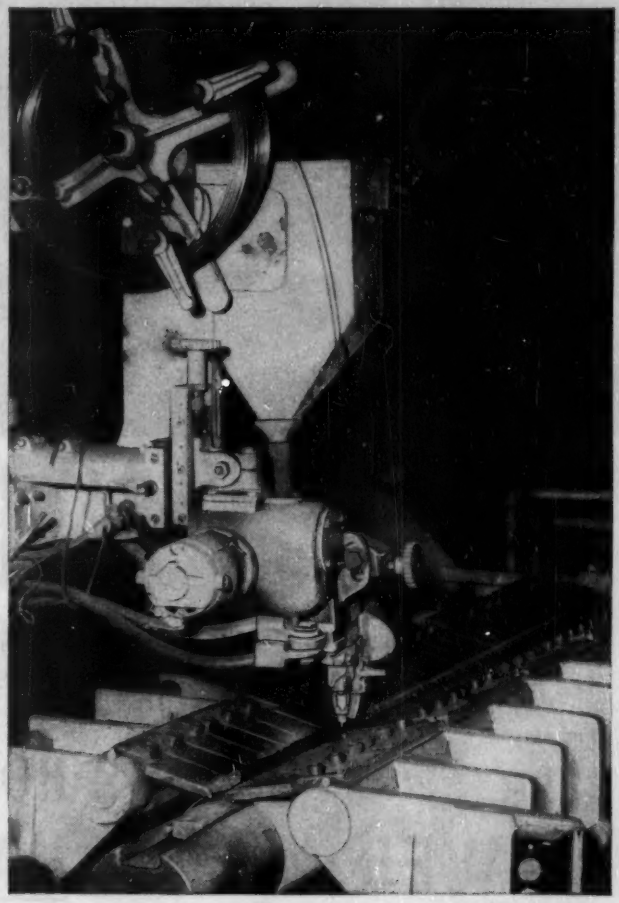

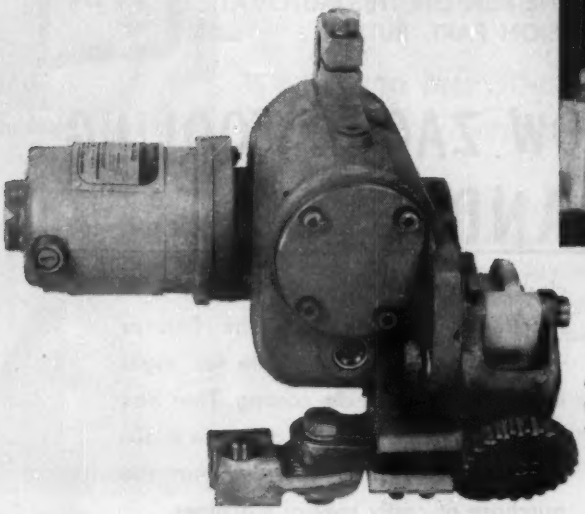

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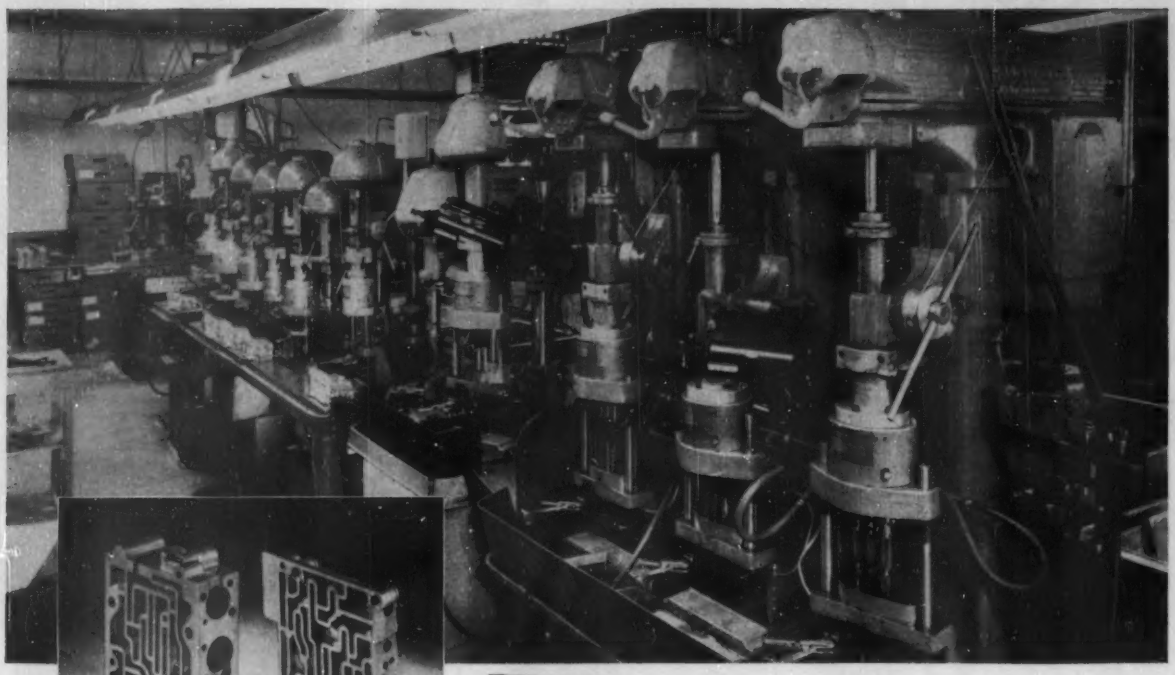

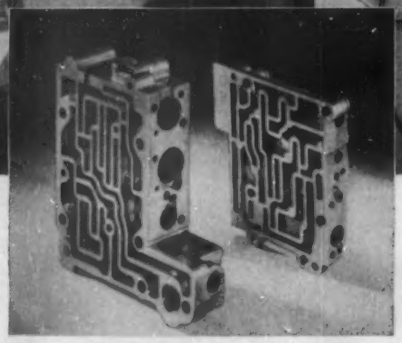

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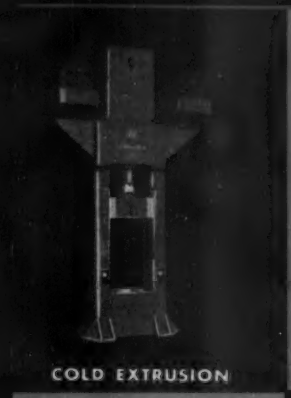
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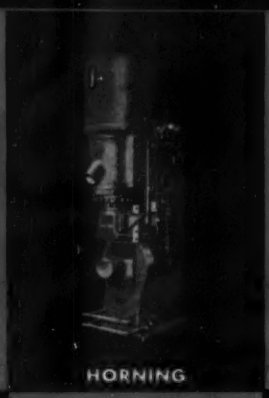
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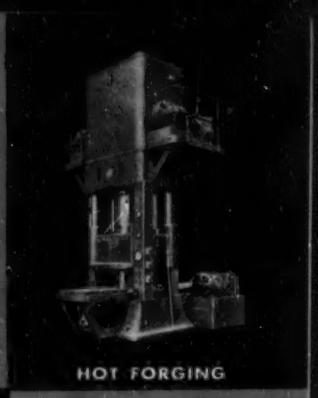
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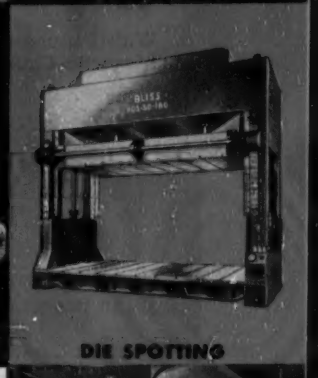
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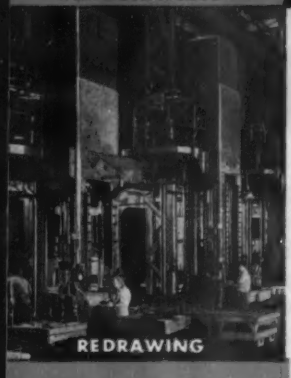
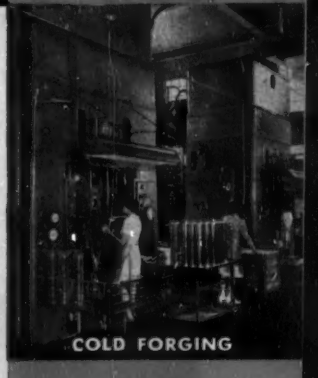

REDRAWING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for lapping and grinding

(not an index table)

With Lapping Plate

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circular precision grinding!

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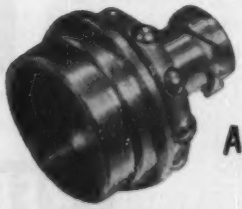

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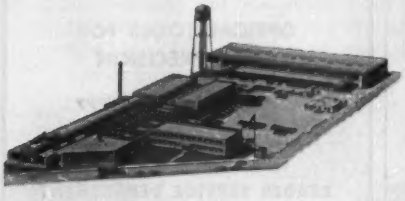

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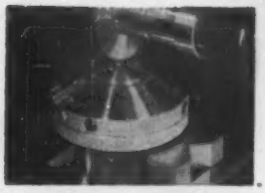

Part with irregular outside dimension is easily held in CHUKOLLET. Internal stop controls depth to ±.0005 inch

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complete with adjustable stop.

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Rotation of outer race ring in the bearing housing is prevented . . . **eliminating housing wear.**

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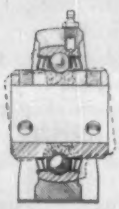

Locking Pin and *Dimple* allow several degrees of misalignment in any direction. **Misalignment of shaft cannot interfere with the effectiveness of the seal.**

oil ...ing . . .

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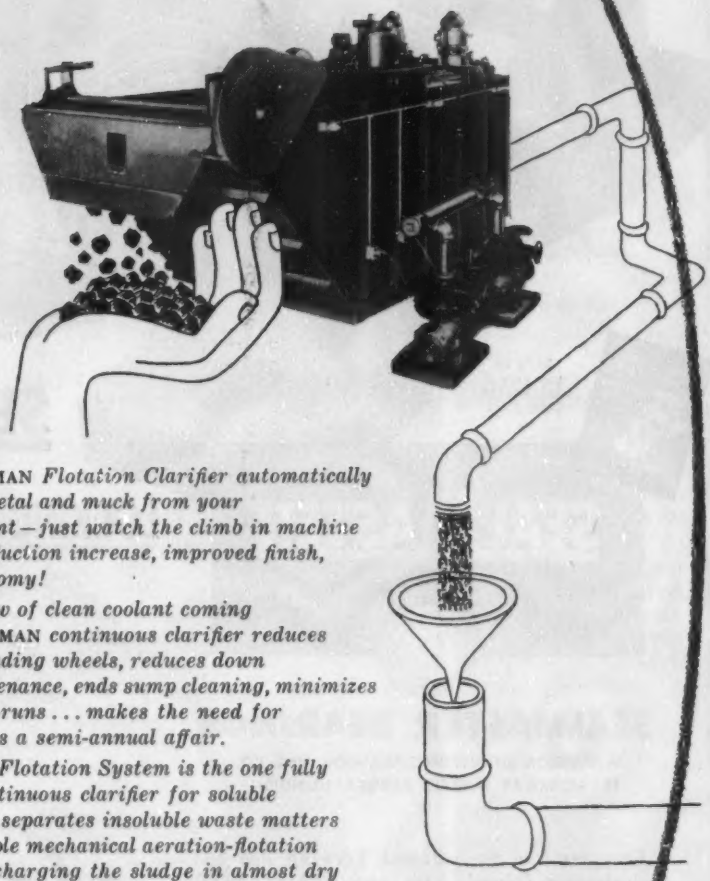

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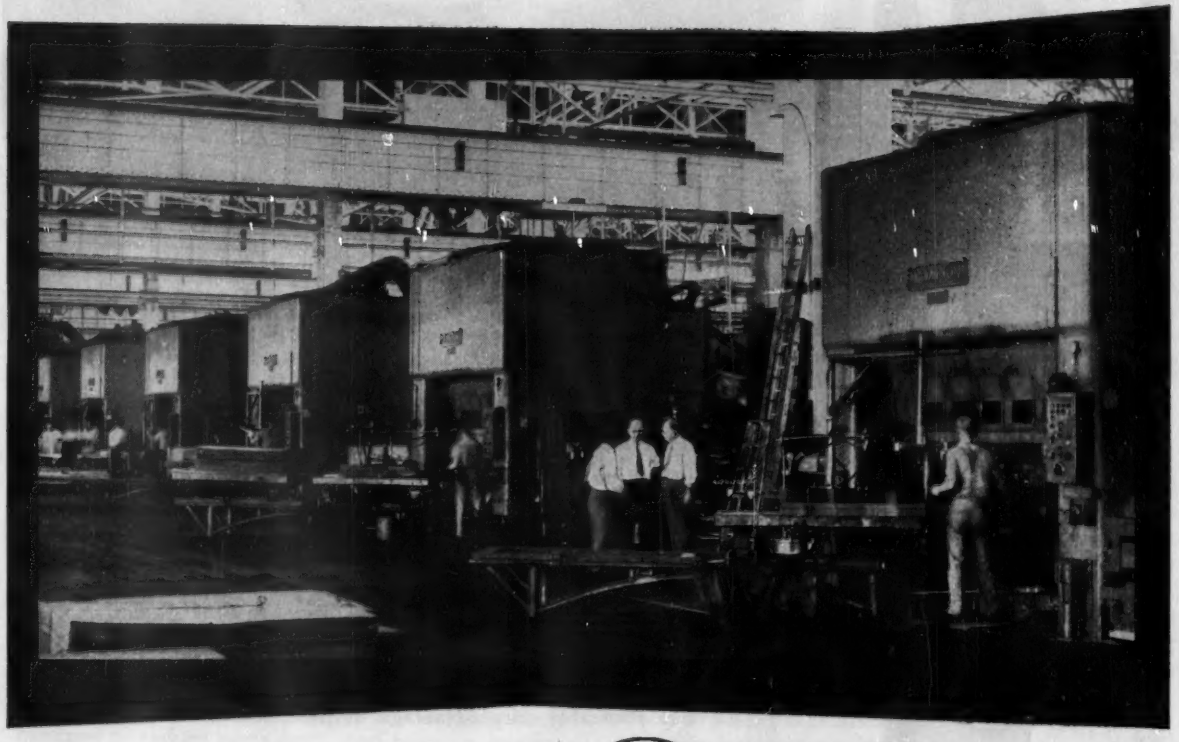

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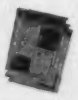

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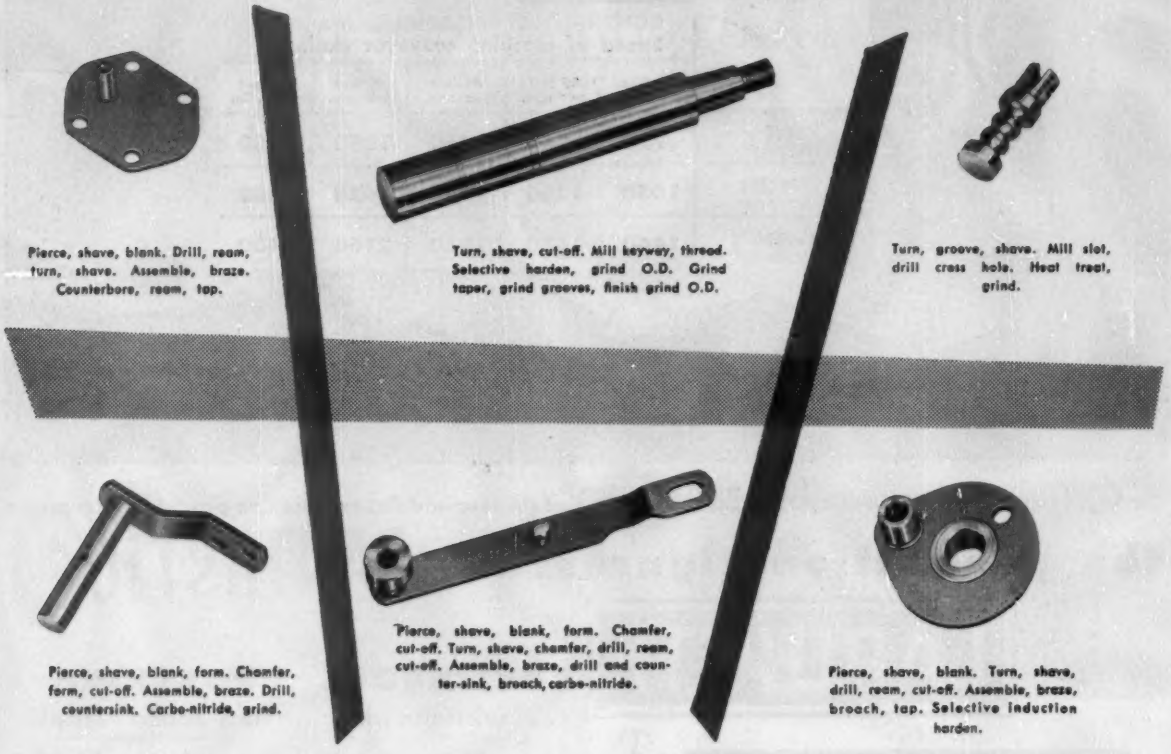

Pierce, shave, blank. Drill, ream, turn, shave. Assemble, braze. Counterbore, ream, tap.

Turn, shave, cut-off. Mill keyway, thread. Selective harden, grind O.D. Grind taper, grind grooves, finish grind O.D.

Turn, groove, shave. Mill slot, drill cross hole. Heat treat, grind.

Pierce, shave, blank, form. Chamfer, form, cut-off. Assemble, braze. Drill, countersink. Carbo-nitride, grind.

Pierce, shave, blank, form. Chamfer, cut-off. Turn, shave, chamfer, drill, ream, cut-off. Assemble, braze, drill and counter-sink, broach, carbo-nitride.

Pierce, shave, blank. Turn, shave, drill, ream, cut-off. Assemble, braze, broach, tap. Selective induction harden.

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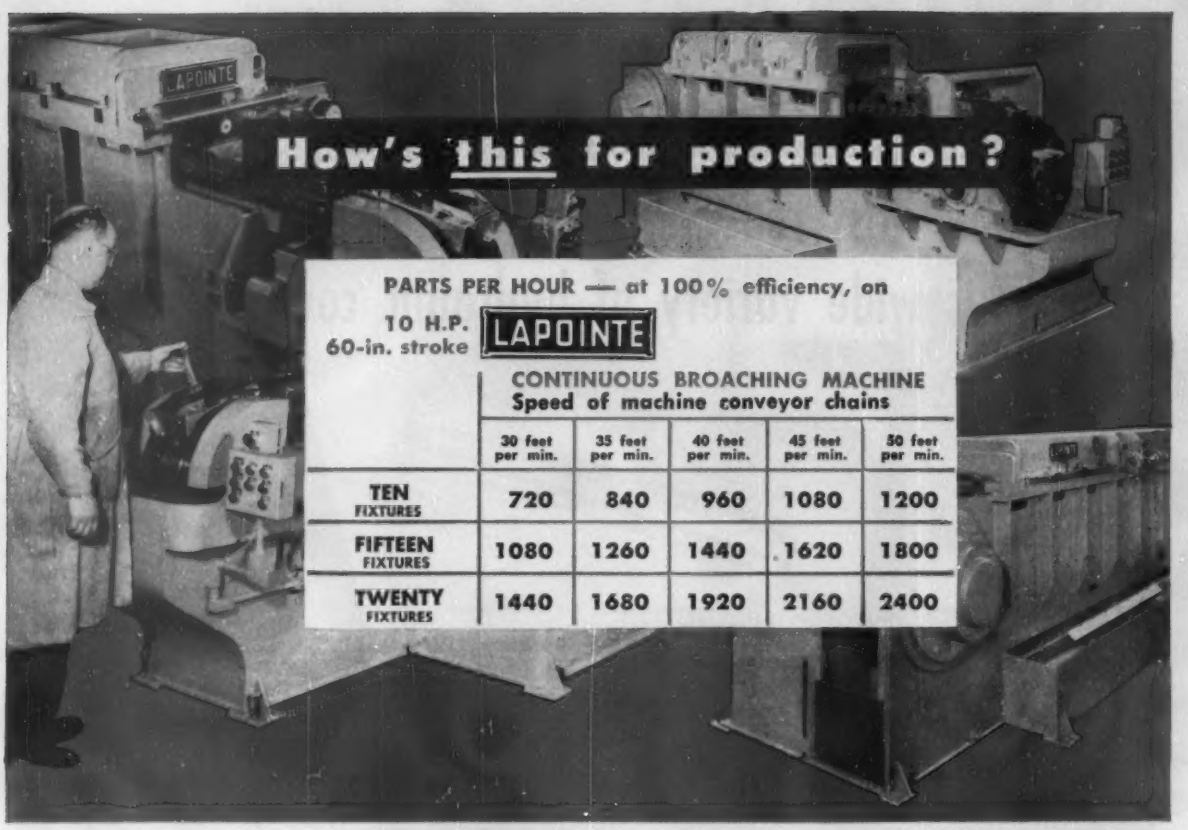

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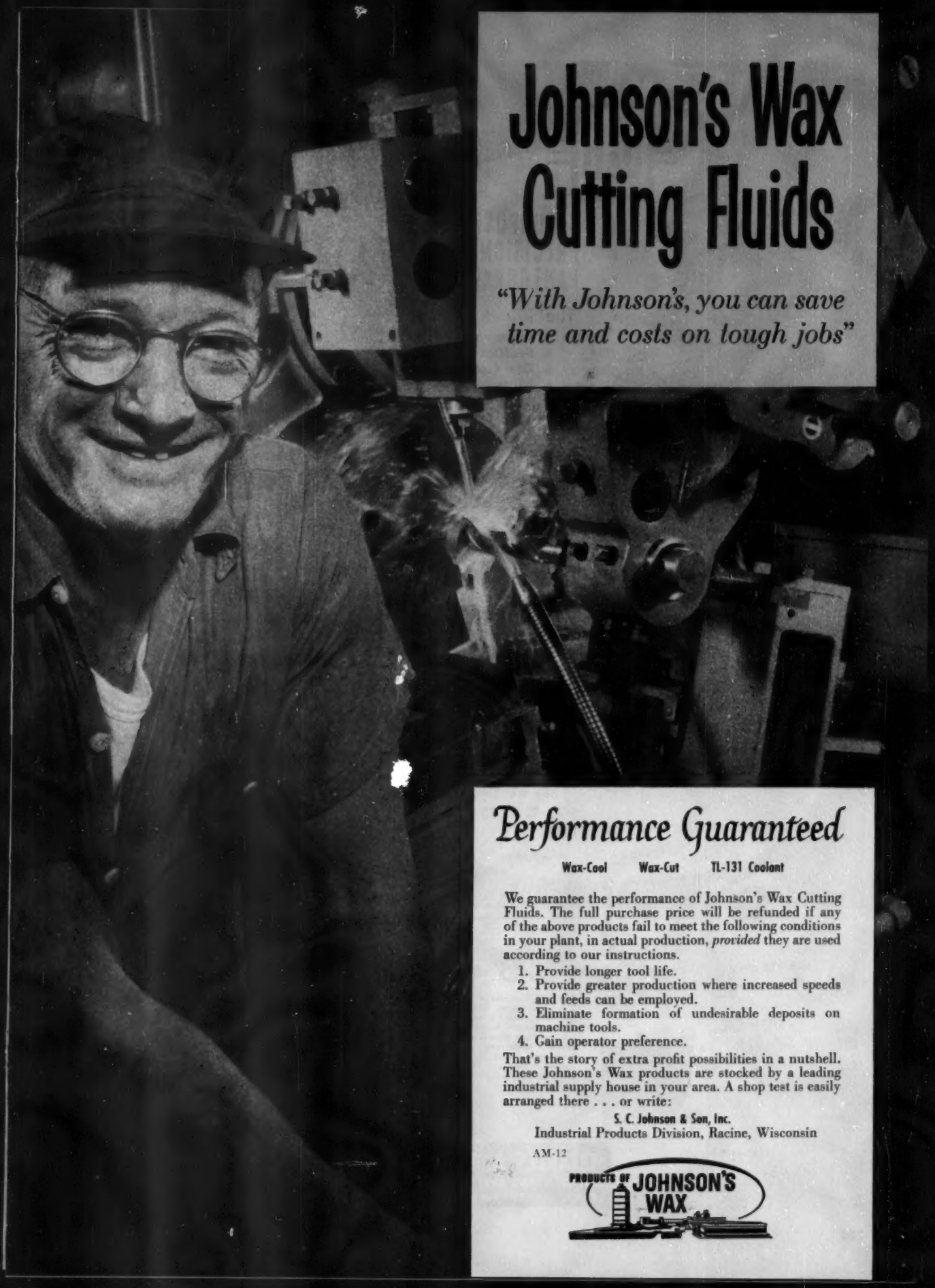

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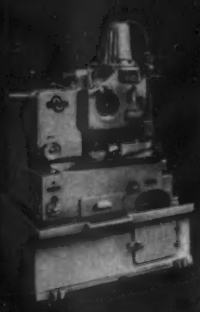
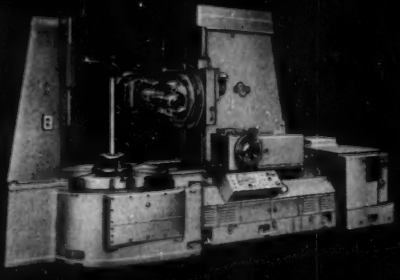




GEAR SHAPERS

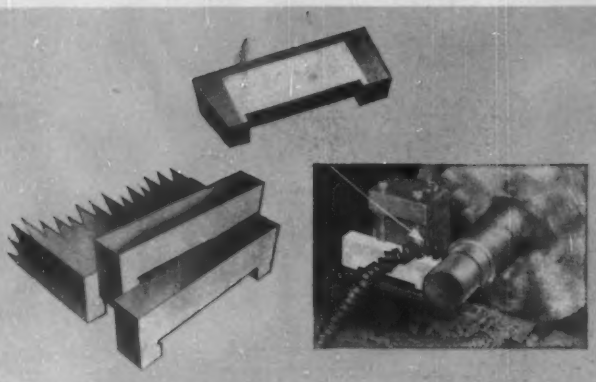
GEAR HOBBERS

CUTTERS

LORENZ

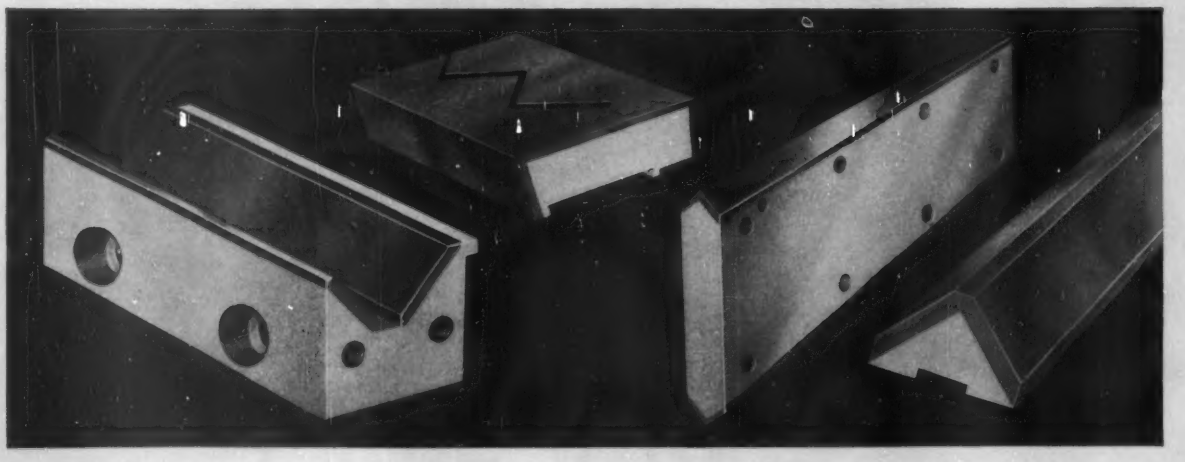
MASCHINENFABRIK ETTLINGEN/GERMANY

to be sure they're OK



these buyers did... A group of prospective lathe buyers witnessed an amazing demonstration of OK Bedway hardness at the Gisholt Machine Co., Madison, Wisconsin. Gisholt uses OK Ways exclusively on their ram and saddle turret lathes, and to prove the quality they (1) took a section from an OK Bedway, (2) made it into a tool bit, (3) locked it in a fixture and cut spiral shavings from 1045 cold-rolled steel.

look before you buy

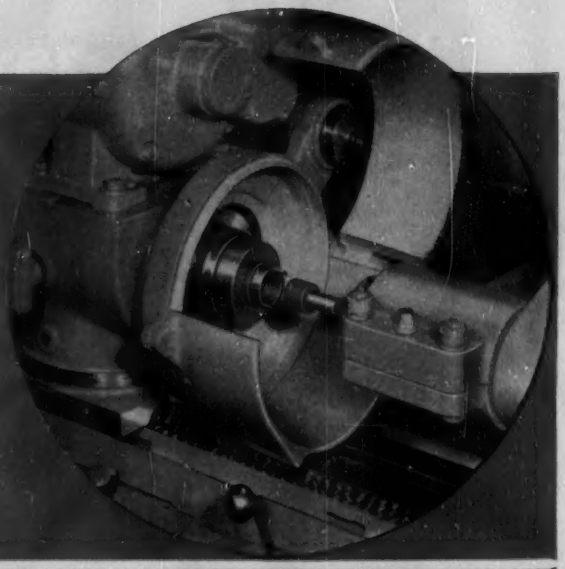


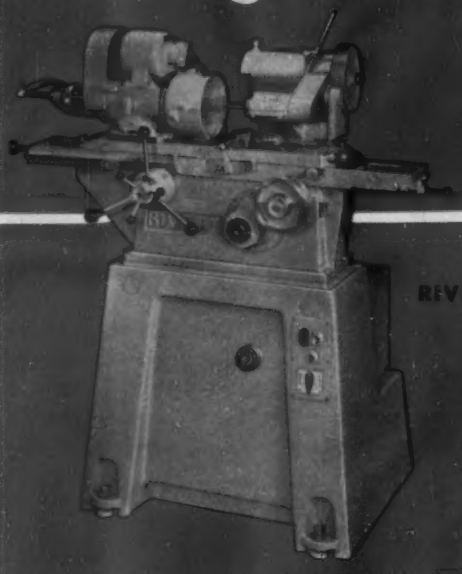
here's why: OK Ways are so hard they're practically wear-proof, which helps maintain constant accuracy throughout the life of the machine. In Ohio Knife's exclusive manufacturing process, long-wearing tool steel is welded to a soft steel backing under 2500 tons pressure. Then the ultimate surface hardness of the special-analysis tool steel is developed with a special heat-treating technique that is far superior to simple flame-hardening, carburizing or induction-hardening methods. The result is extreme hardness, 65-66 Rockwell "C", uniform to 3/16" in depth. Write to Dept. 31-W for comprehensive bulletin.

Manufacturers for the Metal Working Industry of:
SLITTER KNIVES • SHEAR BLADES • ROTARY SHEAR KNIVES
HARDENED SPACERS • HARDENED WAYS • GIBS • BALL RACES
BRONZE WAYS • WEAR STRIPS

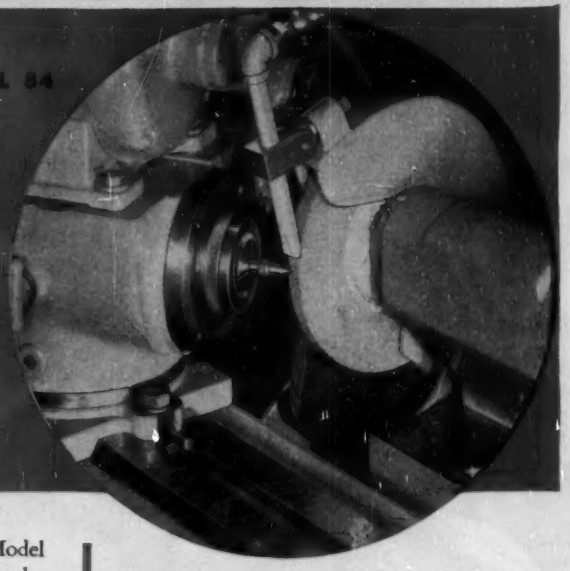
THE OHIO KNIFE CO.
CINCINNATI 23, OHIO

A new small hole grinder





REVETT MODEL 84



Easily converted for external grinding

Flexibility keynotes this new Rivett Model 84. Primarily a small hole grinder, it may be equipped for external grinding. Simplicity reduces set-up time on the variety of work normal to the tool-room and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3" diameter, with a maximum 4" depth depending upon diameter; external work to 3" diameter by 4" length.

If you need versatility with extreme accuracy, you will want to learn more about this new grinder. Send for Catalog 84.

FEATURES

- ★ Optional Wheelheads for internal and external spindles.
- ★ Internal Spindles 12,000 to 35,000 r.p.m.; sealed from grit and pre-lubricated for life.
- ★ Lathe-Type Workhead Spindle mounts draw-in collets and step chucks directly.
- ★ Micrometer Table Stop for positioning work when shoulder grinding.
- ★ Mechanical Power Table Travel with infinite adjustment of speed and stroke.
- ★ Hand Table Travel with coarse and fine feeds graduated to .001".
- ★ Hand Infeed with coarse adjustment to .001", and fine to .0001" reduction of work diameter.

RIVETT **LATHE & GRINDER, Inc.**

Dept. AMR12 Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

pneumatic feed — for speed ...on the SEMI-AUTOMATIC

Nichols Miller

In selecting the Nichols Miller with pneumatic table feed, you obtain precision and a high-production semi-automatic machine. The push-button controlled power feed is entirely automatic — leaves the operator free to merely load and unload the work. Often he may run two or three millers with ease. The air cylinder works against the cutter and the hydraulic cylinder — completely eliminating chatter and table jump. The unit provides rapid advance from loading position to the cutter, infinitely variable cutting feed, and rapid return to loading position. Also available with power vertical feed to spindle head. If you want high production to "tenths", investigate the Nichols Semi-automatic!

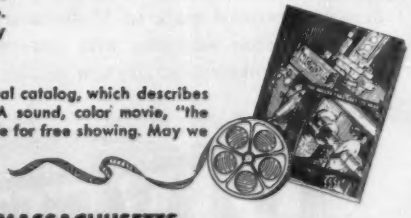
"the miller that uses its head!"

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Travel	
Pneumatic	9"
Cutting Stroke	5⅛"
Hand Screw (Optional)	10"
Transverse Travel	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

The Semi-automatic set up with air vise on a production job. Vise operated automatically by table movement.

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie, "the Miller that Uses its Head" is available for free showing. May we reserve it for you?



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NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION**

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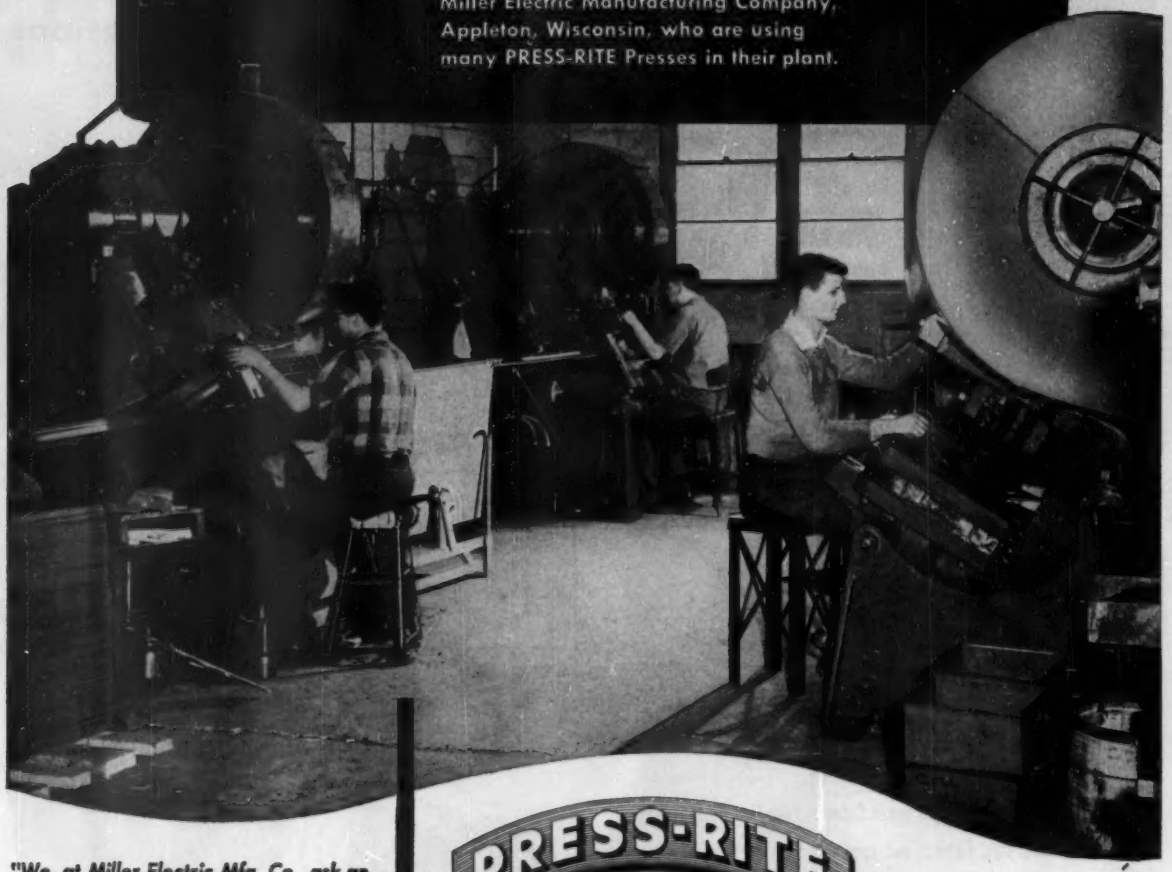
WHITE PLAINS, N. Y.

"We use our presses hard..."

writes: A. E. Harrant, Executive Vice President, Miller Electric Manufacturing Company, Appleton, Wisconsin, who are using many PRESS-RITE Presses in their plant.



"We, at Miller Electric Mfg. Co., ask an awful lot of our Press-Rite Presses, but we always seem to get a lot out of them.

As a leading manufacturer of arc welders and accessories, we produce laminations and various stampings, that come out accurate and true. Our insistence of high quality workmanship, plus the use of high quality material, makes it mandatory that we use quality equipment to produce quality products."

A. E. Harrant

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OPEN BACK—INCLINABLE

POWER PRESSES

. . . ruggedly built for production and service

Ruggedness for the toughest job . . . durability for long continuous service . . . precision built for accuracy and high production . . . all these are built into every one of the 8 PRESS-RITE Presses from 5 to 85 ton capacity. And, there are many other advantages which thousands of users acclaim as they tell of the satisfaction they receive from PRESS-RITE Presses.

The complete story of PRESS-RITE Presses is told in an illustrated 8 page brochure. Write for your copy today. See how PRESS-RITES can help you as they are helping others.

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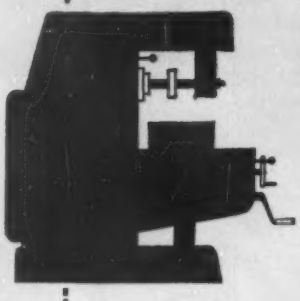
production begins with



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of every description—
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EASIER TO INSTALL AND MAINTAIN!

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extra-wide gutters

all components accessible from front

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DOUBLE-CIRCLE REAMERS

No standard cutting operation demands greater precision than reaming. That's why you'll always want to be certain that you choose close-tolerance reamers. We say that with Double-Circle you are "double certain".

(1) You know that Chicago-Latrobe puts into these tools the finest materials, the most precise workmanship and an unexcelled experience in close-tolerance tool making for superior micro finish.

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Save your large JIG BORERS for large jobs... put small precision work on the LINLEY...

The Linley Jig Borer provides the means . . . at very low cost . . . of handling your most exacting requirements in precision. With it you can cut costs through having a tool exactly fitted to your small work . . . save your larger machines for larger work.

Specifications

Table Movement: 6" x 10" Table Size: 7" x 17½"

Send for complete information TODAY!

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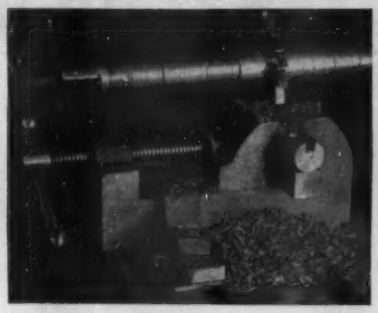

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For quick machine set-ups at low cost, you won't go wrong with a "Yankee" Vise. Takes job through every step with more speed and less work. Lifts off and on a swivel base. Squared on top, bottom, sides and front end for machine work. Easily made into a handy, economical jig. V-grooved block for holding rounds supplied with each "Yankee" Vise. Four sizes, with or without swivel base—1½", 2", 2¾", 4" jaw. Ask your industrial distributor.

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Three outstanding features of "Yankee" Tap Wrenches show the thought given to their design. (1) The little knurled knob on top for starting the tap or backing out. (2) The crossbar held in the most convenient position by friction. (3) "Yankee" ratchet enables you to work in tight places. A slight back and forth movement of the crossbar is enough to make the tap cut.

For free "Yankee" Tool Book, write "Yankee" Tools, 201 West Lehigh Avenue, Philadelphia 33, Pa.

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Schrader has a *complete line* of cylinders that will meet any requirement. They are available in single or double acting in any type of mounting and in any stroke.

Schrader Cylinders will produce a power stroke that cannot be equalled manually. And — don't forget — the complete Schrader Line includes operating and control valves of every type, as well as all other compressed air accessories, from air line to air tool. Write today for full details. The coupon below is for your convenience.

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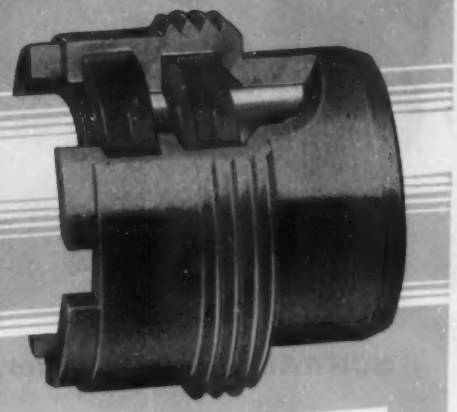
HANNIFIN HYDRAULIC CYLINDERS HAVE REVOLUTIONARY NEW GLAND!

...externally removable and replaceable without dismantling cylinder!



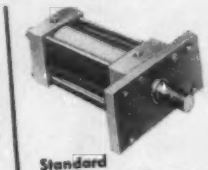
Here's the biggest improvement in cylinder design in the last 50 years. This exclusive Hannifin gland is a bronze cartridge, externally removable and replaceable as a unit to meet J.I.C. recommendations. A face type spanner wrench is the only tool you need. Now look at the packing! The "Wiperseal" serves a dual purpose as it wipes both ways to provide a dry rod on the out-stroke, a dirt-free rod on the in-stroke. The "Lipseal" is self-compensating, self-relieving and non-adjustable... provides an efficient seal throughout its long life. Ask for a demonstration... every Hannifin man carries a cutaway sample of this "jewel" of a gland with him at all times.

SERIES "H" HYDRAULIC CYLINDERS

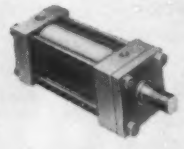
Made in 9 bore sizes from 1½" to 8"... 13 standard mountings... many combination mountings. Extremely close tolerances for easy mounting. Heavy-duty tie rods. Steel heads. Steel cylinder bodies "Tru-Bored" and honed to a satin finish. Piston rods ground and polished then hard chrome plated for minimum friction and long packing life.

TYPICAL MOUNTING STYLES

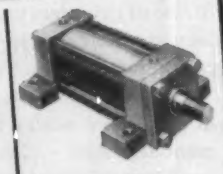
Clevis Mounted



Standard Rod End Flange

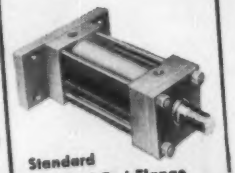


Flush Type

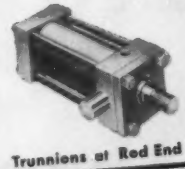


Side Lugs

Heavy Duty Blind End Flange



Standard Blind End Flange



Trunnions at Rod End

Angle Mounted

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Aluminum Air Seal Mfg. Co. Reports:

"OUR PROBLEM WITH GRAVITY OILERS WAS SOLVED BY CITIES SERVICE CUTTING OIL!"

When flow of oil from gravity oilers was restricted by gum formation and residue, Aluminum Air Seal Mfg. Co. switched to Cities Service Chillo #22 Cutting Oil. Results: Plenty of oil flow, increased saw life, cleaner finish cuts!

Here's the report as Cities Service received it from D. C. Cover, Plant Supt. of Aluminum Air Seal Mfg. Co.:

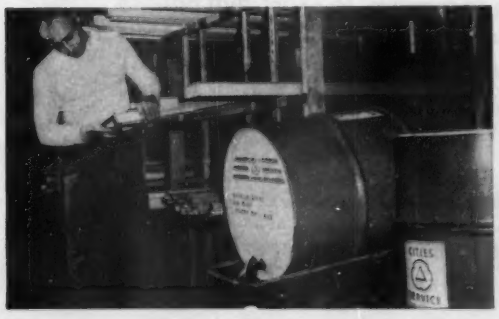
"For the past three years we have been using your Chillo #22 with excellent results.

"Prior to that time, we experienced considerable trouble because our gravity oilers were not functioning properly due to residue and gum formation which restricted the flow of cutting oil to the saw. Consequently, this inadequate supply of cutting oil permitted excessive wear which, of course, greatly reduced our saw life.

"At this time, a Cities Service Lubrication Engineer called on us and recommended Chillo #22 as a solution to this problem. Not only was the problem of adequate supply eliminated but we found the oil gave excellent saw life as well as clean finish cuts.

"As you know, we supply aluminum stock to Trim-a-Seal plants throughout the country. *Whenever a new plant is set up we recommend that they use your product for cutting because we know it will do the job.*"

If you'd like to learn more about the oil "we know will do the job," contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



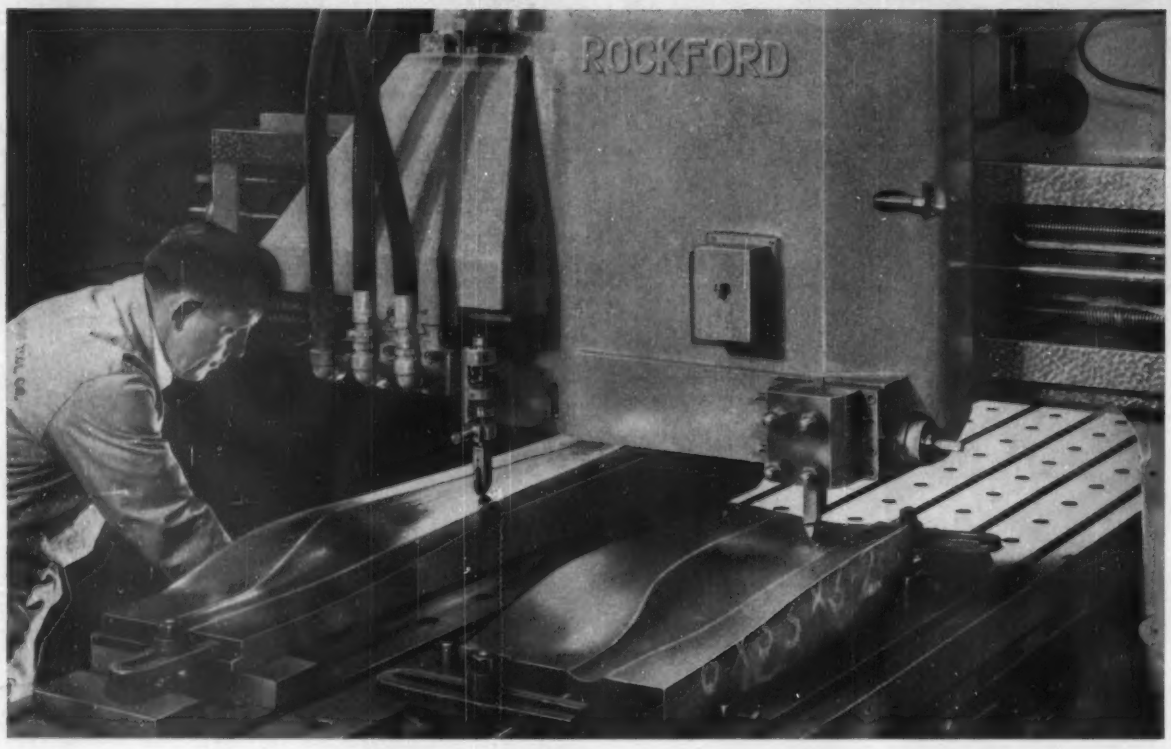
EXAMINING ALUMINUM EXTRUSION, an Aluminum Air Seal employee observes clean cut made with help of Cities Service Chillo #22 Cutting Oil. Firm supplies aluminum stock to 25 Trim-a-Seal plants throughout country.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

a cost cut . . . with every stroke of rockford kopy-kat hydraulic

duplicators



higher production is obtained with every stroke **because...**

the unique Kopy Kat duplicates automatically. Its hydraulic duplicator valve is so sensitive, so exact, that positive duplication of complex forms is done with the ease of straight-production machining.

Ask us for recommendations for your duplicating shaping, planing, slotting and turning work.

OUR 52nd YEAR

ROCKFORD MACHINE TOOL CO.

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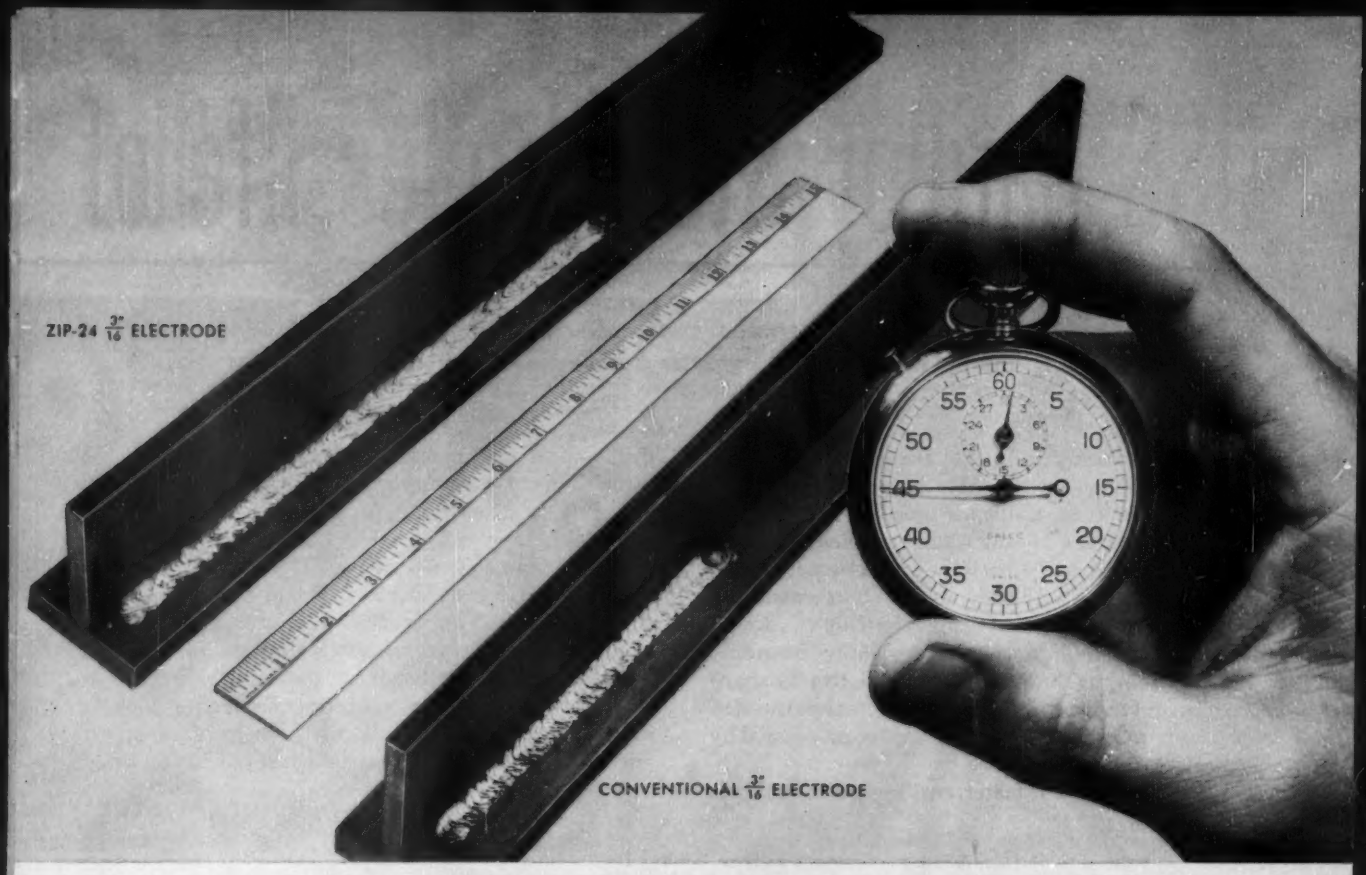

New Westinghouse ZIP-24 Electrode welds twice as fast—better, easier, too

The greatest advancement in mild steel welding electrodes in years. That's what Westinghouse research, plus years of experience as an actual user of welding processes, has made the new ZIP-24. It now gives you a greater combination of plus features than any other powdered iron electrode. For example:

FASTER WELDS—*50 to 70%* greater deposit rates. And an increase of *30 to 50%* in footage of fillet or lap weld per minute.

BETTER WELDS—balanced fillets give appearance of "machined finish" . . . no undercut with fillet and lap welds . . . perfect wall wash-up . . . easier slag removal . . . minimum spatter loss that reduces cleaning time. And if that's not enough . . .

EASIER WELDS—even-edged, smooth, finely rippled weld beads even when handled by an inexperienced operator. It's ideal for "drag" technique . . . gives greater flexibility in weld types . . . can be used with either a-c or d-c. And it's available now for . . .

IMMEDIATE DELIVERY—made possible with the opening of our second electrode plant . . . a brand-new Westinghouse Electrode Plant at Montevallo, Alabama. Over 57,000 square feet of additional manufacturing space to give you immediate delivery on the new ZIP-24 and the complete line of quality electrodes . . . *manufactured by Westinghouse.* J-21859

LEARN MORE ABOUT THE NEW ZIP-24 ELECTRODE!

YOU CAN BE SURE...IF IT'S Westinghouse

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Welding Department, P. O. Box 868, Pittsburgh, Pa.

Please send me a copy of your new folder on the ZIP-24 electrode (B-6389).

☐ I would like free samples of the new ZIP-24 electrode.

☐ Send me literature on the complete line of Westinghouse Electrodes (B-6070).

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COMPANY_____

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AM-12-6-54

USS Carilloy Steel triples life of

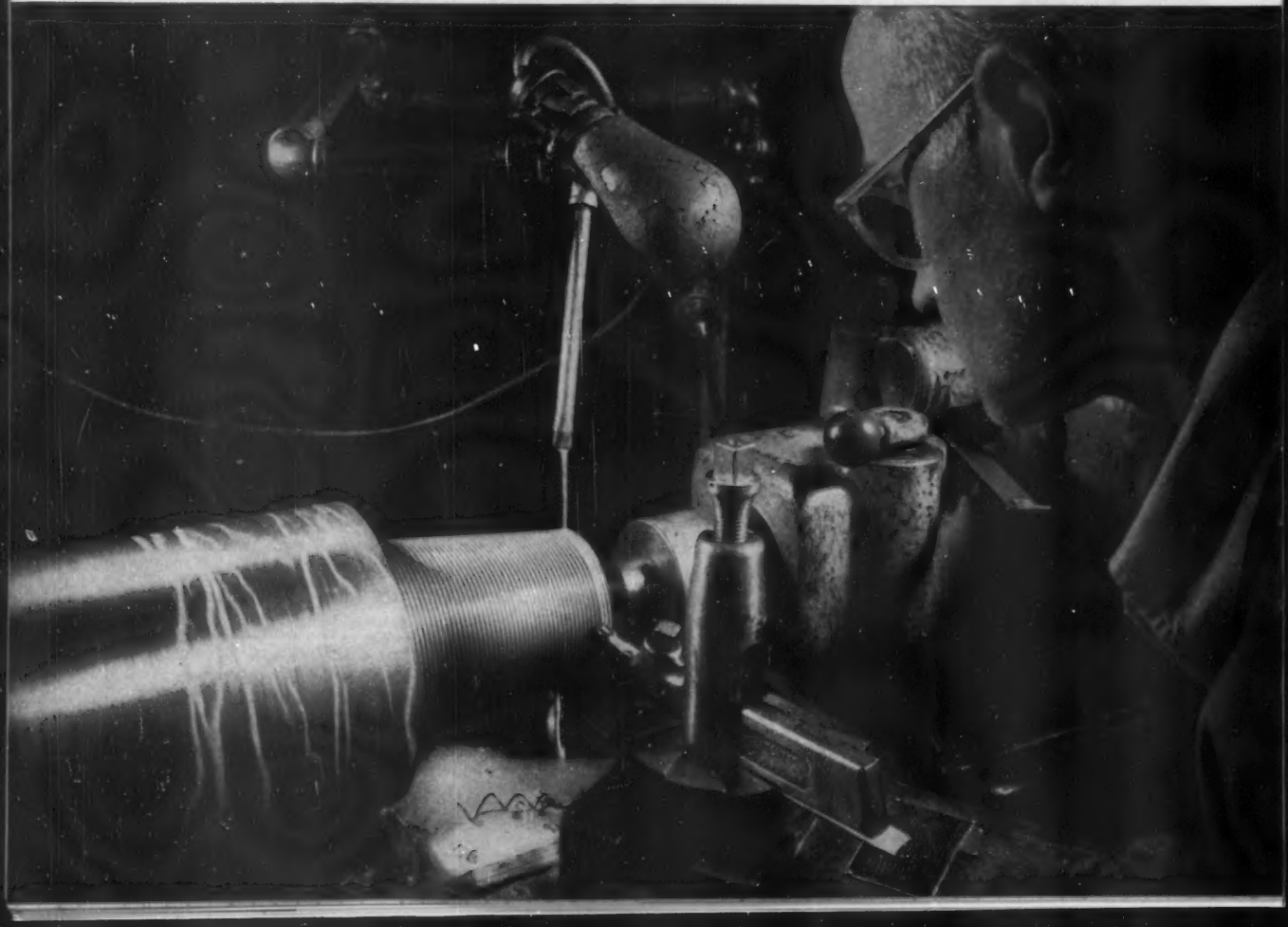
Steel analysis worked out between customer and USS Service Metallurgists gives bits better hardenability, greater resistance to abrasion and abuse.

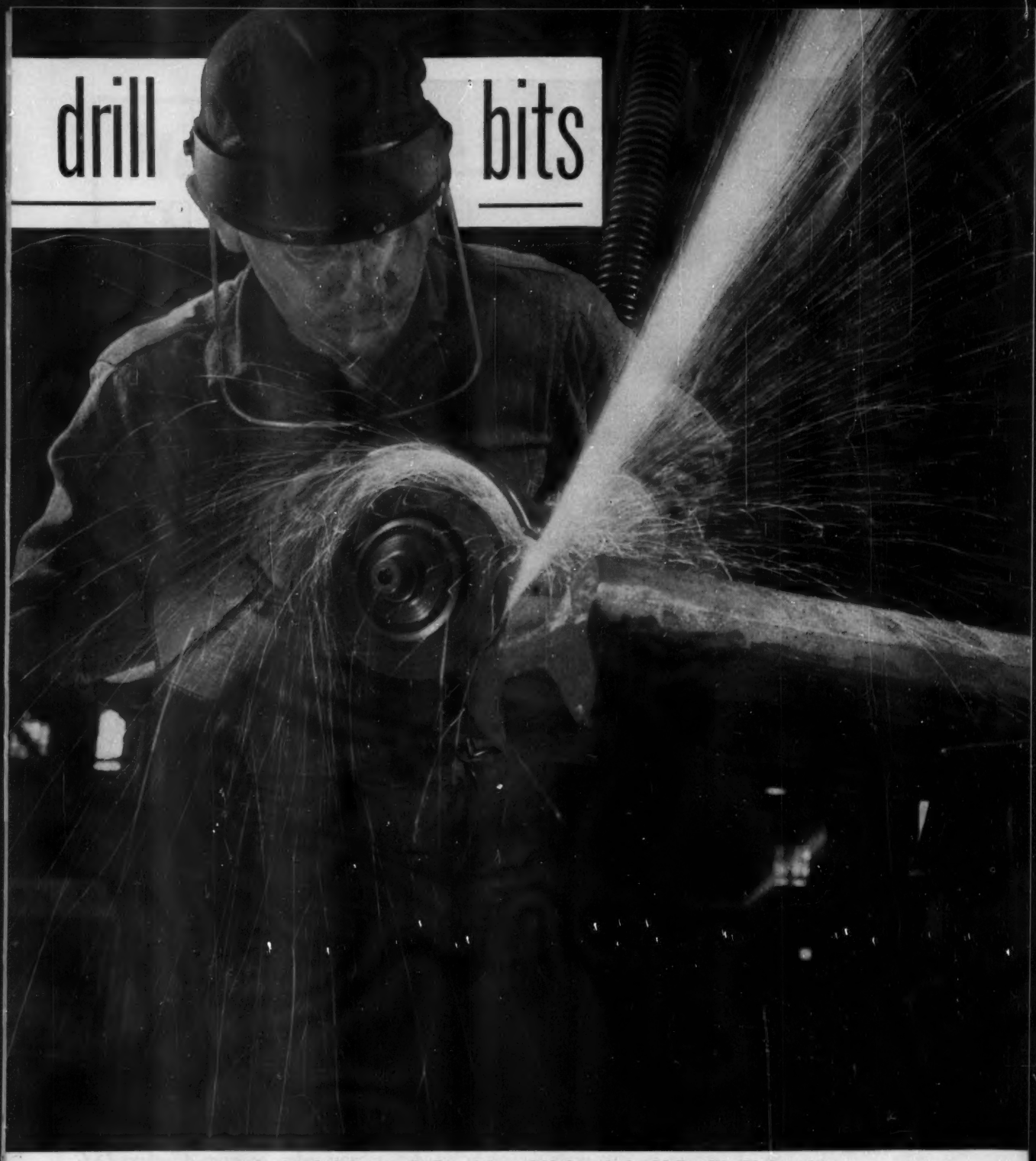
● Spang and Company, Butler, Pennsylvania, manufactures a complete line of cable system drilling tools for oil, gas, and water wells, for prospect drilling, and for shot blast holes. Spang's famous Heat Treated Molloy Bits are made especially for extremely hard, irregular formations, and they must be hard enough to chew through rock, sand, and shale quickly . . . tough enough to withstand a tremendous daily pounding without breaking . . . and durable enough to stay sharp in the most abrasive formation. Spang gets these needed properties in a Carilloy Steel that was recommended by USS Service Metallurgists.

These Molloy Bits cut faster, cost less per foot of hole drilled, and require field dressing and hardening less often than conventional bits. One drilling operator, who switched to Molloy Bits made of Carilloy Steel, increased the amount of hole he could drill between redressings from 15 feet to 58 feet. The Molloy Bits lasted almost four times as long as ordinary bits.

In any rugged application where service is severe—where you need exceptional resistance to abrasion, great toughness or hardness, unusual resistance to abuse, or any combination of these properties—look for a USS Carilloy Steel. And get the help of an experienced USS Service Metallurgist when you have a tough material or production problem.

BELOW, API taper joint and collar of Molloy Bit are turned. The wire-like chip under the piece indicates the high quality and toughness of this Carilloy Steel.





ABOVE, forging flash is ground off semi-dressed blade end of a Molloy Bit. Blade end is dressed to gauge in the field, and redressed periodically when ends wear down. Molloy Bits made of Carilloy Steel last longer, require less frequent redressing than conventional bits.

UNITED STATES STEEL CORPORATION, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO

TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS

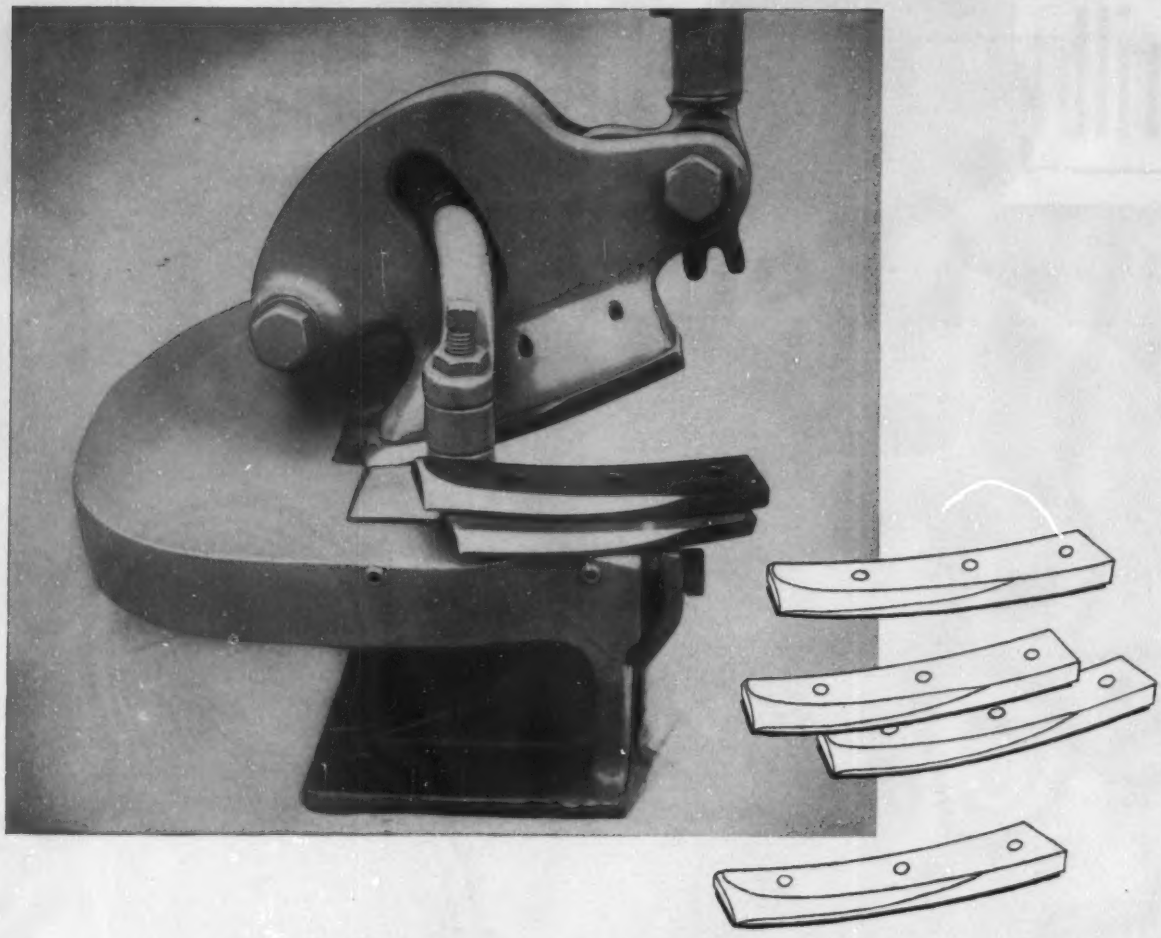
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy USS Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

UNITED STATES STEEL



Shear Manufacturer ups blade life 4 to 5 times...

with A-L HURON DIE STEEL

Write for Your
HURON BLUE SHEET

A compilation of facts on the handling and shop treatment of Huron. Includes complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. *Ask for your free copy.*

Address Dept. AM-60

A Chicago bench shear manufacturer produced some test blades of Ludlum HURON die steel—heat treated to 61-62 Rockwell C.

Service life of the HURON blades proved to be four to five times that of the former blades. Resharpenings were reduced 75 to 80%! Because these new HURON blades held an exact rake and maintained a proper cutting arc, they easily sheared 3/16" mild steel or 10 gauge stainless.

Ludlum Huron was developed for use where high resistance to wear and abrasion is necessary, and where heavy pressure rather than sudden shock must be withstood. Huron has excellent non-deforming properties, and hardens to a great depth.

There is an A-L tool steel that will help solve your cutting, forming or blanking problem. Call our nearest office or distributor today, or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*

For complete MODERN Tooling, call

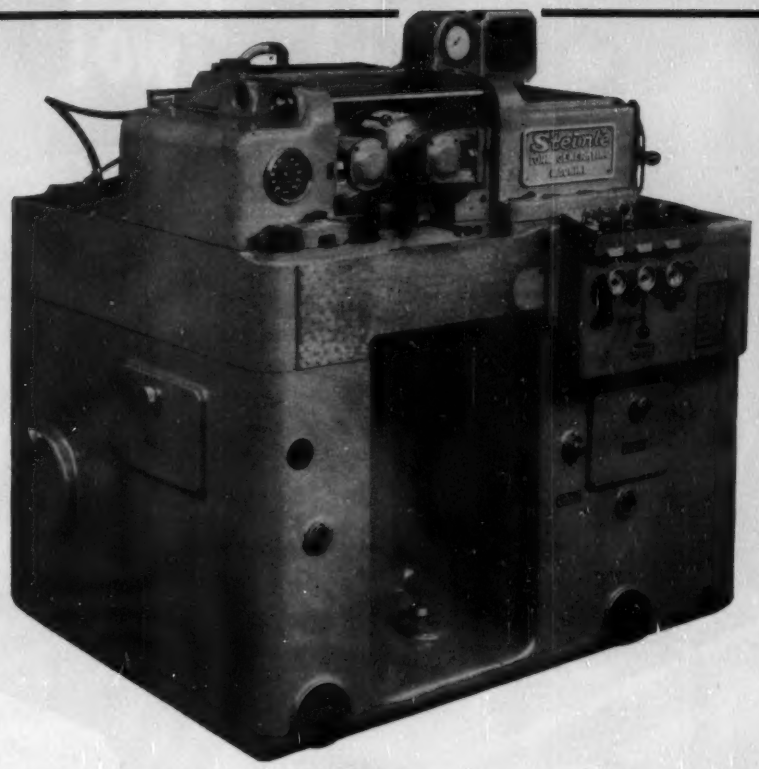
Allegheny Ludlum

WAD 5329

AL® FINE TOOL STEELS SINCE 1854

Here's the BRAND NEW Steinle FORM GENERATING MACHINE

***tried, proved, accepted..... and now in production for* EARLY DELIVERY**



. . . incorporating all the tried and proved desirable features based on fifteen years experience in the design, building and performance of previous *Steinle* models.

. . . enjoying the favorable comment and impression of leading metal-working visitors at the recent Milan Machinery Exposition.

. . . adapted particularly to the precision rolling of large diameter coarse pitch worms . . . gear teeth . . . splines . . . rod lengths of various thread forms . . . also burnishing.

. . . assuring a quality and accuracy of rolling deep forms at high speed superior to that achieved by other methods and with an advantage of greater strength in the resulting forms.

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PRECISION BORING & VERTICAL MILLING MACHINE

By doing both milling and boring operation that ordinarily require 2 or more single-purpose machines, ***work transfers are eliminated,*** and ***setup time is cut to half or less.*** ***Exceptional working capacity*** is provided by unusual cross table travel and vertical capacity. Check the specifications at left.

SPECIFICATIONS

- Table travel—Longitudinal 28"; cross 18"
- Vertical capacity—28"
- Table feeds—Dial type, 16
- Table feeds—per minute, 5/16" to 20"
- Table rapid traverse—both directions, 100"
- Spindle speeds, 16—40 to 2000 R.P.M.
- Boring feeds—infinitely variable, .0000"-.010"
- Horsepower, 7½
- Weight, 8100 Lbs.

Power to handle any job—rugged strength and rigidity —easy and convenient operation —these are only a few of the many other advantages incorporated in the Knight No. 50. Get *all* the details about this remarkable time-saver and profit-maker. ***Mail the coupon today.***

KNIGHT VERSATILE MILLERS ACCURATE • RIGID

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Name.....

Title.....

☐ Send information on Knight's 20" and 42" Rotary Tables.

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"SURFINDICATOR—Eliminates arguments on surface finish!"

"ALTHOUGH IT IS DIFFICULT to estimate the savings made possible with gaging equipment," states Sterling Engine Company, "we have realized definite dollar savings with the Brush SURFINDICATOR* just through the elimination of arguments." Sterling uses the SURFINDICATOR to check finish on many precision parts where a microinch finish is specified.

The SURFINDICATOR speeds inspection, saves time, and can help *you* eliminate costly overfinishing. It can be set up easily for operation by shop personnel. Write for booklet—or ask for a demonstration of the SURFINDICATOR in your plant. Brush representatives are located throughout the United States. In Canada: A. C. Wickman, Ltd., Toronto.

*Trade-Mark

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Paving the way for the new tax laws on depreciation, a House Ways and Means Committee report (HR No. 1337) stated, "The average machine . . . actually depreciates considerably more and contributes more to income in its early years of use than it does in the years immediately preceding its retirement."

"PAYD"* PLAN

gears new equipment payments to fast depreciation

* "PAY-AS-YOU-DEPRECIATE", C.I.T.'s new plan, is based on the fast, more realistic depreciation schedules allowed by the new tax law. It offers you the best purchase plan for buying and depreciating new equipment.

"PAYD" helps you buy new machine tools, construction equipment and other profit-making, cost-cutting machines. Now 70% of the depreciation can be taken in the first half of the life of your new asset. And your "PAYD" installment payments are *geared directly to your new, fast depreciation allowance schedules.*

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Write regarding your specific job problems . . .

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DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

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GIANT KEYSEATERS

M & M Giant Keyseaters, built in a wide range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems today.

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Heavy Duty

QUICK ACTION TOGGLE CLAMPS

Extra CLEARANCE
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and now **Extra SERVICE** assured by the use of

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at all bearing points, in the popular C-100, CQ-1100, and CQ-800 series Toggle Clamps.

Rugged construction—drop forgings, cast steel and solid bar stock.

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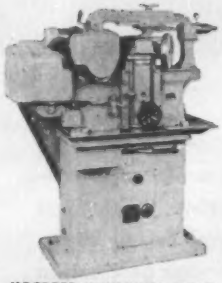
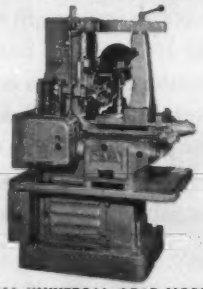
THESE MACHINES ARE UNEXCELLED FOR SIMPLICITY OF OPERATION, PRECISION AND UNIVERSAL APPLICATION

2" KOEPFER Precision Gear Hobber for small Precision Gears up to 2" Dia.



KOEPFER UNIVERSAL GEAR HOBBING MACHINE FOR FINE PITCH GEARS - SPUR, SPIRAL AND WORM GEARS UP TO 4" DIA.



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NEW #3 - UP TO 10" DIA.
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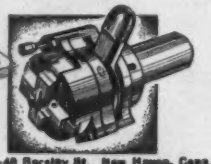

famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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CAN BE HOT STAMPED IN COLOR WITH THIS ACROMARK NO. 2AH HOT STAMPING MACHINE WITH DIAL FEED.

IT WON'T MARK PORCELAIN ENAMEL THOUGH.

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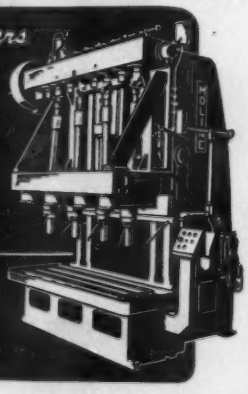
For Over 50 Years

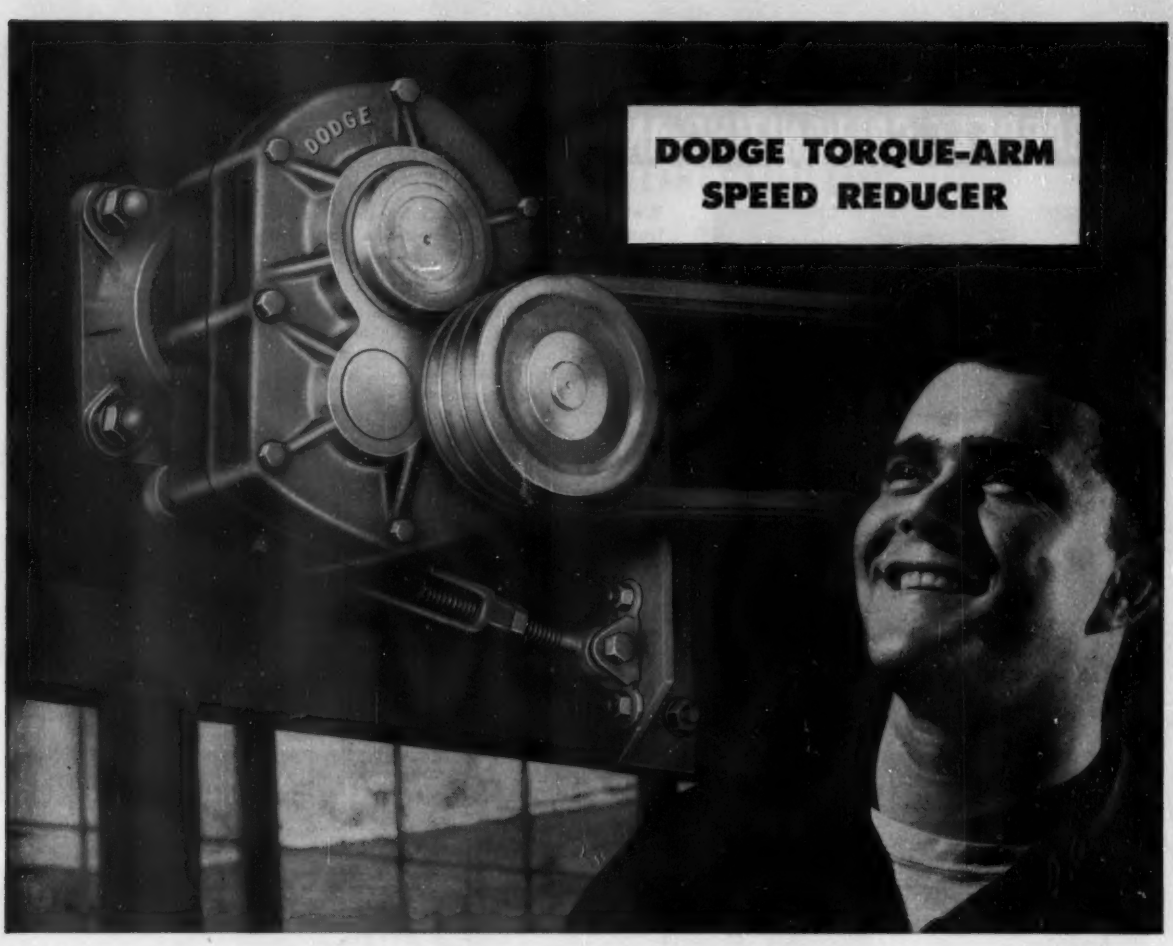
"HOLE-HOG" *Specially Designed* MACHINE TOOLS

Have Cut Production Costs for American Industry



MOLINE TOOL CO.

No. HU68—Hydraulic rail feed universal joint type multiple spindle drilling machine.



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This reducer is mounted directly on the driven shaft. No foundation, no flexible couplings, no sliding base required. No lining up difficulties. The torque-arm, fastened to any fixed object, anchors the reducer. Unit is driven through any V-belt drive. Stock Taper-Lock Sheaves prescribed for each job. Tri-Matic Overload Release and Backstop are available if desired.

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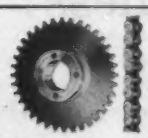
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TAPER-LOCK SHEAVES

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BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With the Barrett Whizo Galvanizer, excess metal is quickly removed from small parts after dipping in molten metal, in fact, much faster and more uniform production is assured. Parts will also pass the most rigid inspection for quality.

The method of handling is simple and easy. Work to be coated is placed in a round basket and submerged in molten metal. When thoroughly heated, the basket is placed in the Barrett Centrifugal to be immediately accelerated to high speed, the excess metal being thrown off before it can cool.

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Machines furnished with or without heated surrounding drum, in capacities from 40 to 240 loads per hour, handling from 5 to 100 lb. loads. When used for tinning threaded work, rethreading has been found to be unnecessary.

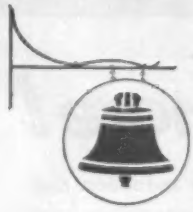
Barrett Centrifugals are used extensively, combine speed with convenience of operation and the utmost in safety. They are highly developed to meet all reasonable requirements, have self-contained motor drive and occupy a minimum of floor space.

•

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery



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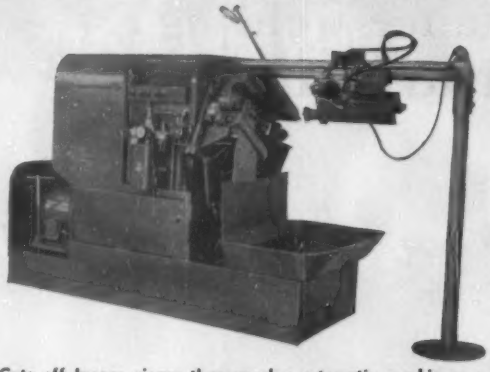
MODERN CUTTING-OFF MACHINE



Cuts off longer pieces than regular automatic machine—*any length you want.* FAST cutting and chamfering of tubing, pipe, shafting. Check the following figures:

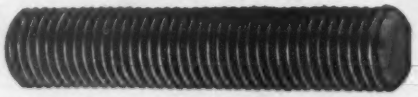
½" Tubing
Cuts and Chamfers both outside edges of ½" .035 wall tubing, 5" lengths, every 2.5 seconds.

1¼" Cold Rolled
Cuts and Chamfers both ends, 20" long, at rate of 1 every 20 seconds.

1" Tubing
Cuts and Chamfers both outside edges, pieces 5" long. One every 3 seconds.

4" THREADED STUDS

Modern Automatic Cutting-Off Machines available in 4 sizes, handling work up to 6¾" O.D.



WRITE FOR CATALOG Cut and chamfered at one time—in 8 sec.—from 10 ft. length of stock already threaded (¾" U. S. Standard). Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

MODERN MACHINE TOOL CO.
2005 LOSEY ST. JACKSON, MICHIGAN

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COOLANT AERATOR
PAT. PEND.
FOR SOLUBLE & LIGHT OILS

Connects to the coolant line and mixes atmospheric air with coolant resulting in a non-splash aerated mixture that clings to work and tools. Good for lathe, milling, drilling, grinding, etc.

Lathe Set-Up with Mel-O-Flo Coolant-Aerator No. 600

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NON-SPLASH — Aerated Coolant does not splash — keeps operators and floors dry.

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SIMPLE INSTALLATION — Mel-O-Flo COOLANT AERATOR connects directly to the coolant line — no compressed air is required.

LOW COST — Model #600 Mel-O-Flo COOLANT-AERATOR With 12" Flexible Hose .....only $17.50
Model #601 Mel-O-Flo COOLANT-AERATOR Less Flexible Hose .....only $14.50

Write for Full Details — Operating Range: 5-60 psi

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Precision Power Presses and Feeds Since 1889

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Sensitive Drilling and Tapping Machines for Economy and High Production

Capacities to 1½"

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RANDALL and STICKNEY Dial Gauges and Indicators

Model C 50 B

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2⅛" overall diameter, balanced dial 0-25-0 with .0005" graduations, ⅛" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
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Makers of Dial Gages Since 1896

The Machine Tool The User Boasts About

ROYAL OAK
HAS THE
FACILITIES
THAT
PAY OFF
IN DIE,
JIG, GAGE
AND
FIXTURE
QUALITY
Jig grinding is an operation that enables Royal Oak to produce gages, jigs, and other precision work to closest tolerances and quality finish. This Moore Jig Grinder, with offset provisions and special attachments, grinds internal and external surfaces and contours.
ROYAL OAK TOOL AND MACHINE CO.
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REPRINT OF RECENT FRONT-COVER ADVERTISEMENT IN "TOOLING & GAGING"

The Moore Jig Grinder

Thumb through the next facilities booklet that comes across your desk... look at the trade journal advertisements stressing topflight facilities ...chances are you'll see one or more Moore Jig Grinders featured prominently.

The Moore Jig Grinder has become the Cadillac of the toolroom (while remaining in a Chevrolet price range). It's a center of attraction on plant tours. The plant manager will point to it, beam like a new father showing snapshots of his offspring, and say: "And there's our Moore Jig Grinder!"

Why do so many users point with pride to the *Moore* Jig Grinder?

Because Moore invented the first jig grinder to relocate and grind straight and tapered holes to "tenths" in a fraction of the time required by other means.

Because the current No. 2 Moore Grinder extends this function to regular and irregular contours, making standard practice of former "trick" operations.

Because this machine employs the lead screw measuring system to assure accuracy, flexibility and speed.

Because electric heating elements and many other features have been designed into the Moore Jig Grinder to assure dimensional stability and wear resistance—and, consequently, *permanence* of accuracy.

Because it's the perfect partner for the popular Moore Jig Borer in achieving accuracy, speed and economies on countless toolroom and production jobs.

For complete information on the machine tool *the user* boasts about, write today for the Moore Jig Grinder catalog.

Moore Special Tool Company, Inc.
738 Union Ave., Bridgeport 7, Conn.

ADD MOORE SPEED + ACCURACY TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

HISEY Drill Grinder for both...

"BOY SIZE" and "MAN SIZE"

Sharpening

HOLDER FOR DRILLS 1/16" TO 3/8"

HOLDER FOR DRILLS UP TO 2½"

(This side can also be arranged for wet grinding)

Grinds ALL your Drills { small AVERAGE LARGE

You don't send a boy to do a man's job . . . neither is the reverse economical. But, with two drill holders ONE *Hisey* Drill Grinder conveniently, quickly, and economically handles ALL drill grinding jobs . . . even with inexperienced operators. A sharp, correctly ground drill . . . (1) drills faster (2) drills more holes per grind (3) drills to exact sizes (4) reduces breakage (5) increases life of drill by removing less metal when sharpening.

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We also manufacture Bench and Pedestal Grinders and Buffers, Tool Post Grinders and Disc Grinders

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HOW TO RUN AN ENGINE LATHE

This 15-page *American Machinist* Special Report discusses engine lathes, and turning tools and operations. Many helpful drawings. 25 cents.

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MEASURE TO 1/10,000th

All graduations are well-defined black lines on dull chrome surface for easier and surer reading, even in poor light. Guaranteed accurate within one half of a ten thousandth of an inch.

Drop-forged model with chrome finished micrometer head, from $8.25 up. Ask for Micrometer Catalog

No. 901C 0-1" Size with LOCK NUT and RATCHET and 10th vernier as shown $13.25

This tool with TUNGSTEN CARBIDE tipped anvils $15.75

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SHELDON U.S.A. CHICAGO

More will be *profit* with a SHELDON

It actually costs less to do turning jobs on a Sheldon Precision Lathe. Machine-tool investment is cut to a fraction. Power cost is materially reduced. Less experienced operators can operate Sheldons safely and efficiently. Even cost-loadings for plant—floor space, heat and light are lower because two Sheldons can often operate in the space occupied by one large lathe.

On most "everyday" jobs a Sheldon will actually turn out more pieces per hour too. With double V-belts to the spindle Sheldon lathes deliver enough power to take heavy cuts in direct drive, at high speeds. Sheldon's "Zero Precision" Taper Roller Bearings permit work to the closest tolerances. Seldom are such extremely accurate bearings used in moderate priced lathes.

You will actually keep more as profit if you use Sheldon Lathes.

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4234 N. Knox Ave.
Chicago 41, Illinois

For More Facts Circle 384 on Reader-Service Card

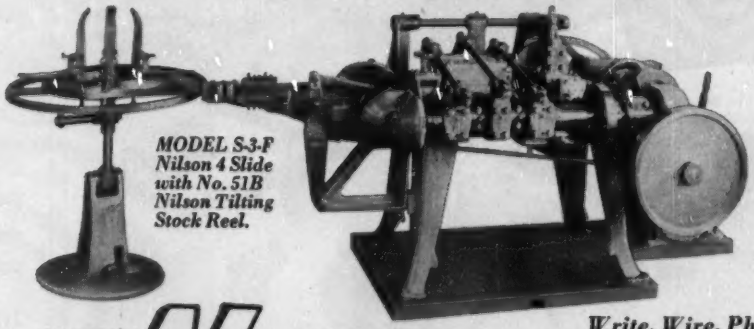
"Switching to NILSON 4 SLIDES Saved us $17,656 on metal alone"

Yes, simply by changing stamping methods, this NILSON Customer profited 4 ways:

1. Production increased 80%.
2. 72% less metal used (per 4 million pieces).
3. Greatly improved quality with minimum of rejects.
4. Strengthened competitive position with greater profit margin.

You, too, can enjoy these advantages in producing your own wire forms and small metal stampings. Parts such as illustrated in the margin were straightened, fed, pierced, blanked, swaged, stamped or coined, cut-off and formed AUTOMATICALLY in NILSON 4 SLIDES in one quick precise operation. *ONE* Machine. *ONE* Operator.

NILSON 4 SLIDES available in wide range of sizes: forming Wire up to ½" diam. in feeds to 32" max. and Metal Ribbon stock up to 3½" wide. Press sections 5 to 30 ton capacity. Heavy Duty Types in 50 and 75 ton models.



MODEL S-3-F Nilson 4 Slide with No. 51B Nilson Tilting Stock Reel.

Write, Wire, Phone for full particulars.

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DPS POWER SCREWDRIVERS and SELECTIVE PARTS FEEDERS will give you outstanding performance: greatly stepped-up assembly speed, lower costs, accuracy and uniform results.

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Understanding ALLOY STEELS

By removing the cloak of mysterious, highly technical terminology, this *American Machinist* Special Report clarifies the differences in commonly used alloy steels.

Alloy steel is just plain carbon steel to which one or more other elements are added to change some property or properties of the base material. These elements may affect the mechanical, magnetic, or chemical properties of the steel. This report discusses the relationship of alloy steel to plain carbon steel, and describes the alloy properties in terms of the standard classification.

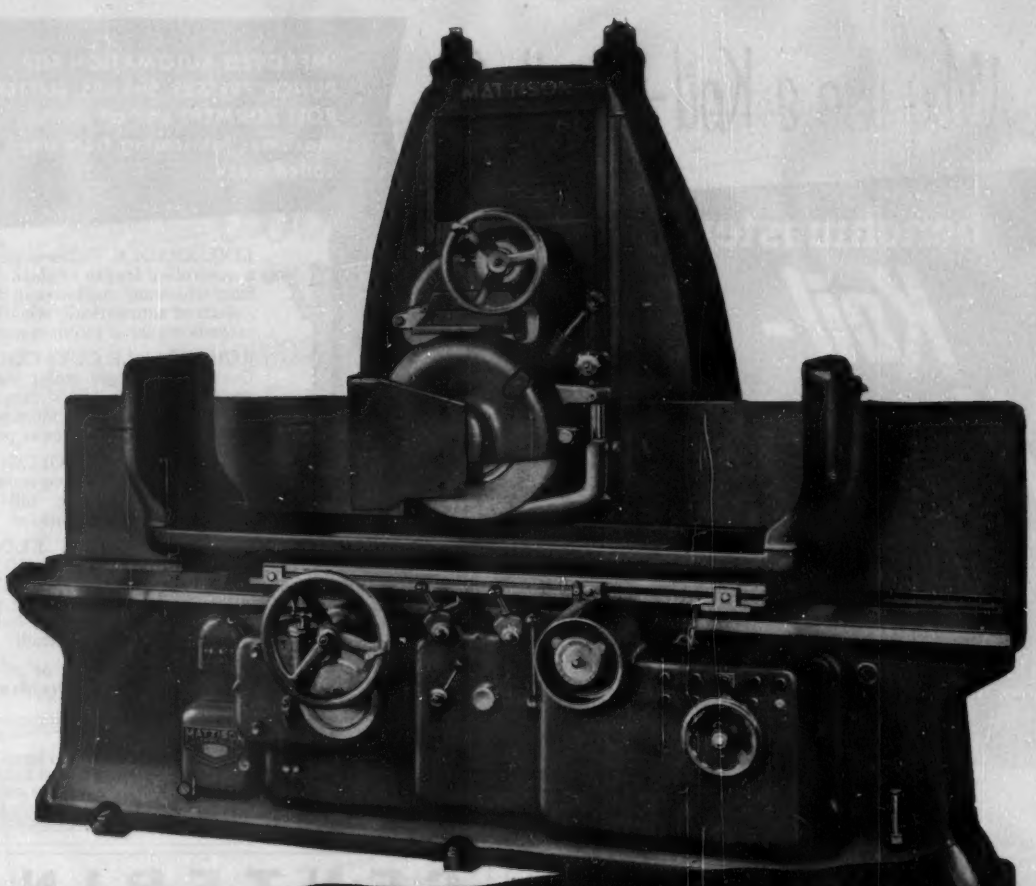
This is one of a new series of *American Machinist* reports written to simplify metallurgy for the non-metallurgist. Earlier reports in the series discussed brass, and plain carbon steel.

10 pages — 15 cents a copy

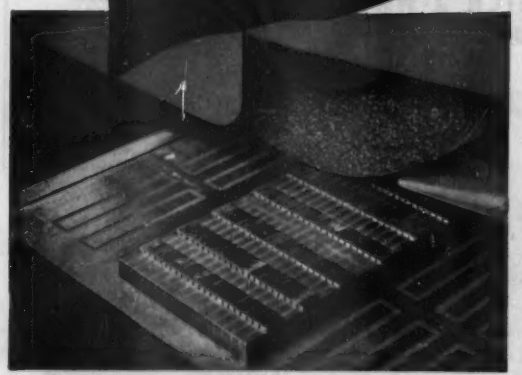
READER SERVICE DEPT.

American Machinist

McGraw-Hill Building
New York 36, N. Y.



HERE'S A CHANGE THAT INCREASED PRODUCTION FROM 30 PER HOUR TO 200 PER HOUR



Both sides of type-stamps are now ground 200 per hour on a Mattison Grinder. Previous production—30 per hour.

● Because of the greater load and grinding area of their Mattison High Powered Precision Surface Grinder, Geo. T. Schmidt, Inc., Chicago, Illinois have been able to effect considerable savings in grinding time over their previous method. As an example—the type stamps shown in the picture above were formerly ground a few pieces at a time on a small grinder—30 per hour. The Mattison Grinder they are now using provides larger table space and a larger grinding wheel together with the necessary power and stability to permit the grinding of more pieces per load at a production rate of 200 per hour. Similar results are obtained on other parts.

Mattison High Powered Precision Surface Grinders have the high power and rugged double-column construction for rapid stock removal and the precision necessary for high quality finish and accuracy to close limits.

This combination not only will enable you to step up production on small parts, but permits grinding large work which previously could not be handled. For further information send for free circular.

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ROCKFORD · ILLINOIS

Why use a Koil-Kradle?

IMPROVED AUTOMATION FOR PUNCH PRESSES, SHEARS, SLITTERS, ROLL FORMERS and all similar machines fabricating from any coiled stock.

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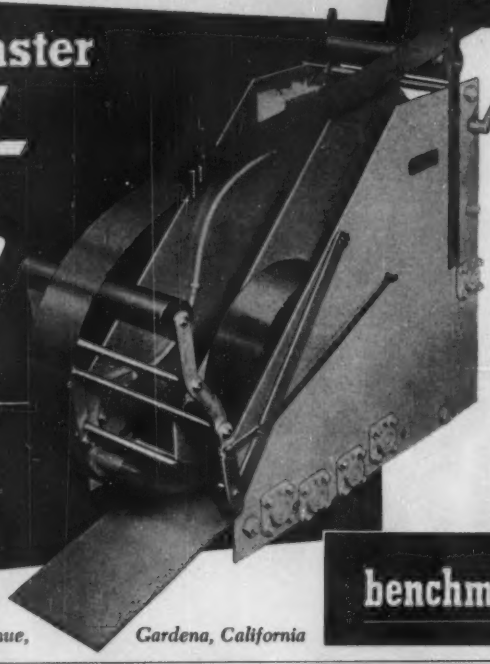
Koil-Kradle

with VARI-LOOP Control



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KOIL-KRADLE makes available a *controlled length of slack loop* from which any machine can draw ...shuts off automatically when loop exceeds machine requirements.

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SAVES VALUABLE FLOOR SPACE—No need for 8 to 10 feet of wasted space...KOIL-KRADLE butts against any machine it supplies. Compact, occupies only a few feet of floor space itself!

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Special Machinery

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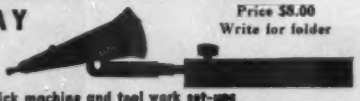
REICH 3-WAY PRECISION TEST INDICATOR



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For quick machine and tool work set-ups
Lifetime conical bearings, stainless and non-magnetic. Sturdy construction. Needs no service or adjustment. .014" reading.

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WALTHAM SUB-PRESSES...

. . . for precision work

Arch Sub-Press

The cylindrical plungers in the Waltham Sub-Presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

Overhang

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HIGH STREET, WALTHAM, MASS.

. . . SO THEY BOUGHT OUR

double duty!

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Mr. H. J. Sandford
Chief Engineer
The L[illegible] Manufacturing Co.
Cincinnati, Ohio

Dear Mr. Sandford:

In answer to your inquiry of the 12th, we have integrated facilities for engineering and fabricating complete assemblies, component parts or heavy weldments to your specifications.

With fully equipped plants in Bedford and Euclid, Ohio, our company has the largest independent machine shop and custom welding facilities in the Cleveland area. We do not offer a pure design-engineering service, but are prepared to work with you in the final refinement and production of your products. Experience gained in developing and producing several proprietary products . as well as those of our customers . . . has given us a broad, flexible range of capabilities.

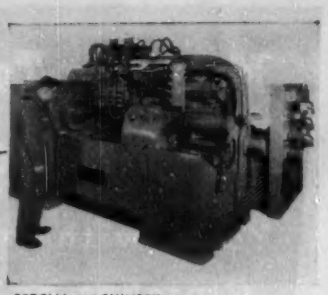
I will be in Cincinnati next week and look forward to seeing you. In the meantime, if you will send blueprints of the products you mentioned, I will have our engineering and production people prepare estimates of cost and delivery.

Many thanks for your interest.

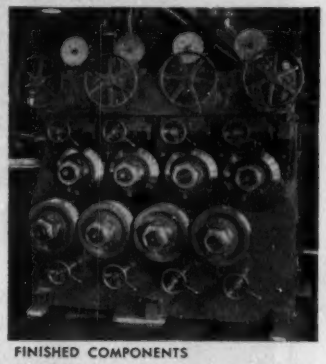
Cordially yours,
THE LEWIS WELDING & ENGINEERING CORP.

James T. Lewis, Jr.
President

JTL:al

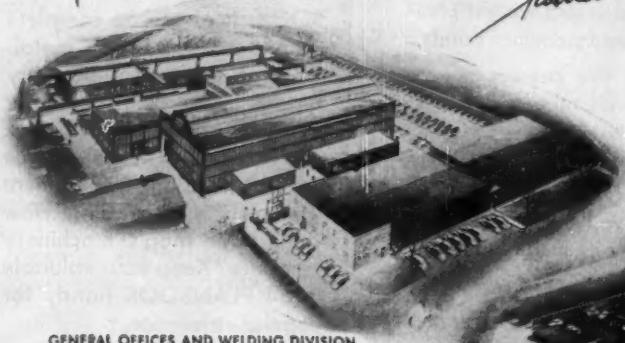


SPECIAL MACHINERY
This high-production 100-h.p. lathe was custom-built by LEWIS.



FINISHED COMPONENTS
This roller straightener was built to exacting customer specifications by LEWIS.

PRECISION WELDMENTS
Massive press base being welded automatically



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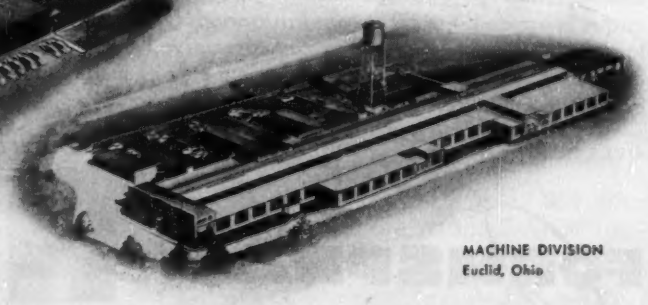

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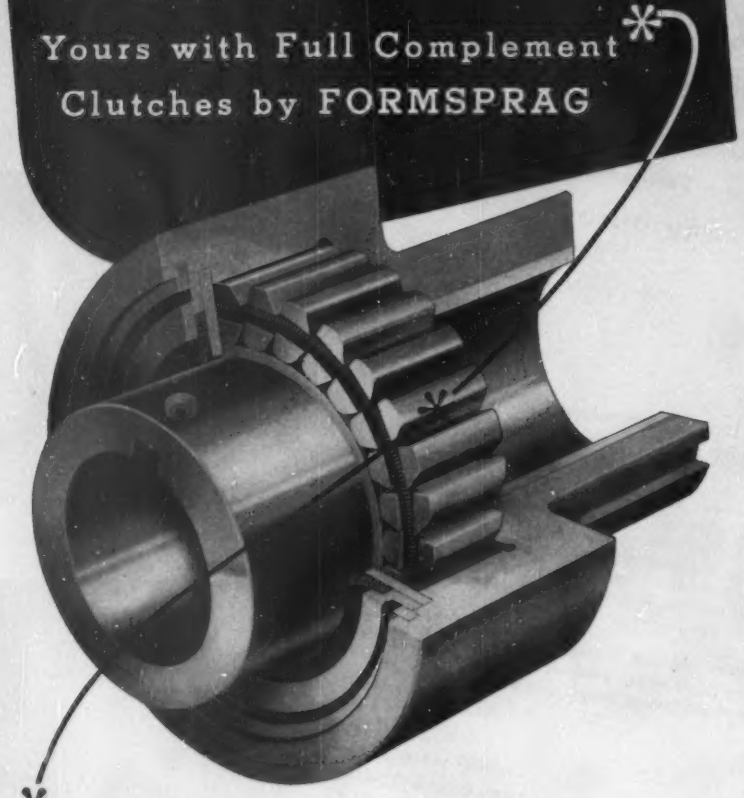
Maximum Torque Capacity— Long Life—

Yours with Full Complement* Clutches by FORMSPRAG



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Here's Why

You can have maximum torque capacity for size and weight plus long life because of low unit stresses at changing contact points.

A full complement of sprags is inserted in the annular space between an inner and outer race. Contact with race surfaces is maintained by energizing springs.

The energized sprags grip at an infinite number of positions. When torque is applied, the sprags *instantaneously* engage . . . when torque is removed, they *instantaneously* release. Positive, accurate engagement and disengagement may be made hundreds of times per minute – with no backlash.

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FORMSPRAG Company E-11

23585 Hoover Road • Van Dyke, Michigan

New catalog—send for a free copy before you specify any other clutch.

Machining Time Slashed from 33½ min to 5½ min

At the Hotpoint Company, a T-lathe, used to contour face and bore a supercharger diffuser, has cut machining time on the part from over 33½ minutes to just over 5½ minutes.

Thousands of actual case histories like this one, of how modernization is *paying off*, are presented in your 1954 PRODUCTION PLANBOOK for Metalworking. You will find the new PLANBOOK, which came to you in November as part of your regular *American Machinist* subscription, packed with the kind of dollars-and-cents facts and figures you need to help guide you in planning for your own efficient replacement program.

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The PRODUCTION PLANBOOK for Metalworking

is published every November by

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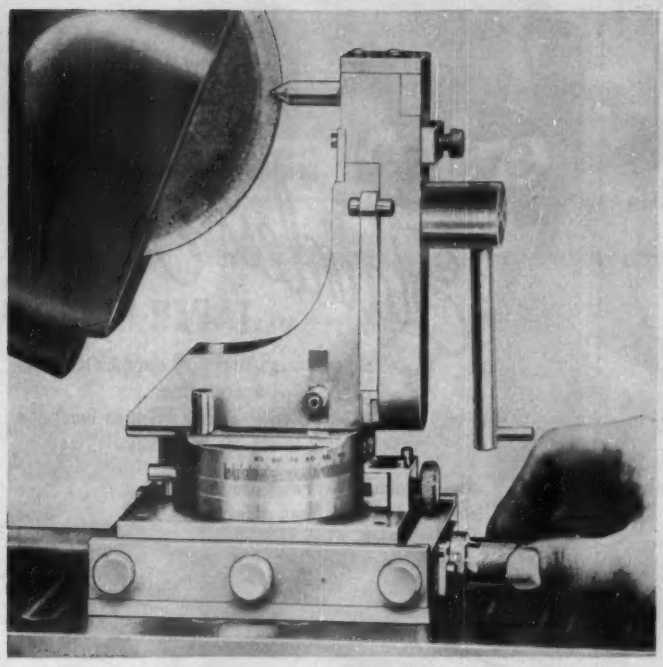
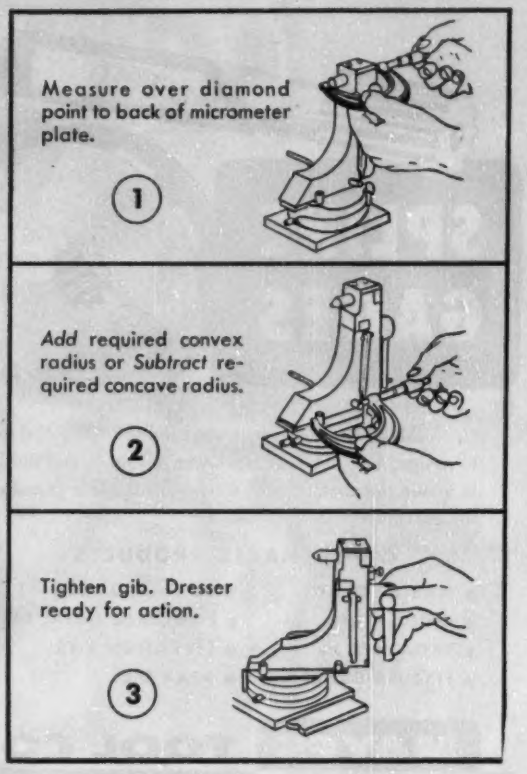


YOU CAN DRESS WHEELS UP TO 24" IN DIAMETER WITH J & S "FLUIDMOTION" WHEEL DRESSERS. MODEL REC SHOWN HERE.


Measure over diamond point to back of micrometer plate.
1
Add required convex radius or Subtract required concave radius.
2
Tighten gib. Dresser ready for action.
3

How to set angles in seconds, radii in minutes—save hours

These easy instructions show you how you can with a J & S "Fluidmotion" Wheel Dresser

Dressing wheels with a J & S "Fluidmotion" Wheel Dresser is easier than you might think. All you need is a micrometer and simple hex wrench. With a little practice, you can set 2 angles in about 10 seconds, a radius in just 2-3 minutes. Here's how to go about it:

To Obtain One Angle

Adjust center line of grinding wheel to height of diamond. The swivel base of the dresser is graduated at 100° on each side of center. Loosen knurled knob and hold both pins which protrude from bottom rings. Then simply set desired angle, tighten the knurled knob, and you're ready for action.

To Obtain Two Angles

Loosen knurled knob and set the pin on the *bottom ring first* for one angle. Then move pin on the middle ring for the other angle. Tighten the knurled knob—that's all there is to it.

To Obtain a Convex Radius on Grinding Wheel

Measure master reading over diamond point to back of micrometer plate (drawing #1) . . . for example	2.531"
Add required convex radius (drawing #2)	+ .069"
Setting for micrometer pins	2.600"

To Obtain a Concave Radius on Grinding Wheel

Measure over diamond point to back of micrometer plate (drawing #1) . . . for example	2.900"
Subtract required concave radius (drawing #2)	−2.142"
Setting for micrometer pins	.758"

Tighten gib. Dresser now ready for action (drawing #3)

How much time and trouble can a J & S Wheel Dresser save you? Figure it up. Then write us for complete information.

J&S TOOL CO., INC.

WHEEL DRESSERS • JAW CLAMPS • PRECISION VISES • SINE BARS • DOWN-HOLDING DEVICES

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MAYES spline gages are carefully controlled as to design, material, heat treatment, tolerance and finish to assure our customers of the best obtainable gage for the part inspected.

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STEEL Stanho PRODUCTS

Stainless Steel TAPER PINS

Complete stock, all sizes #7/0 through #14.
Special sizes to order.
Milled or Centerless Ground (Precision Type).
Made to accurate tolerances.

Also "Stanho" Taper Pins made from selected screw stock, Monel, Brass, Aluminum or other metals. Clean bright finish —prompt shipments.

Write for description and prices.

JM-6

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Since 1872 NEW BRIGHTON PA

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RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

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Are selected for dependability, longer life and greater capacity. Standard sizes are carried in stock. *Write for our general catalog No. 19.*

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To get more from your Surface Grinder Investment

. . . take advantage of DoALL *Versatility* plus *Precision!*

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. . . Plunge and Crush Grinding

CYLINDRICAL GRINDING

ANGULAR GRINDING

AUTOMATICS AND SPECIALS

NEW DoALL Surface Grinders will handle an unlimited variety of surface grinding, cylindrical grinding and form grinding jobs with heretofore unobtainable precision and speed.

There is a complete line of accessories to extend the usefulness of the grinder for all classes of production line and toolroom work. Modifications in basic grinders can be provided for special applications.

In all cases rigidity and precision of the machines is such that you can rely completely upon handwheel settings.

For a bigger return on your grinder investment, specify DoALL.

Call your DoALL Store, or write: *THE DoALL COMPANY, Des Plaines, Illinois.*

FREE DEMONSTRATION.
A grinder demonstration will be made upon request at any plant.

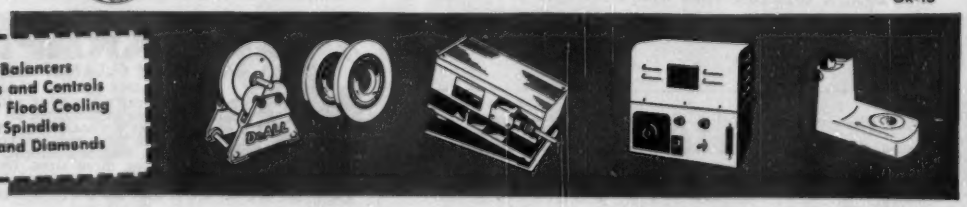
NEW CATALOG.
Contains complete data on 7 new DoALL grinder models.

MOTION PICTURES.
Two new sound, color films "Techniques of Surface Grinding" and "Extending the Range of Modern Surface Grinding" are available for group showings.

DoALL

GR-15

Wheels and Balancers
Magnetic Chucks and Controls
"Cool-Grinding," Flood Cooling
High Speed Spindles
Radius Dressers and Diamonds



KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.
Let our engineer study your keyseating problems.

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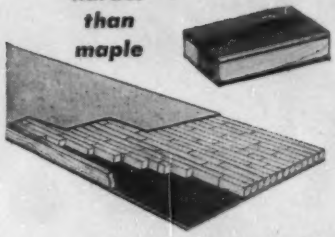

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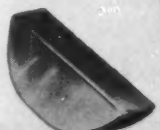

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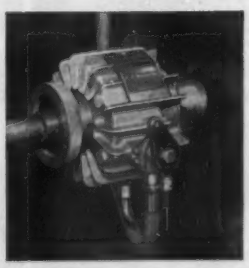

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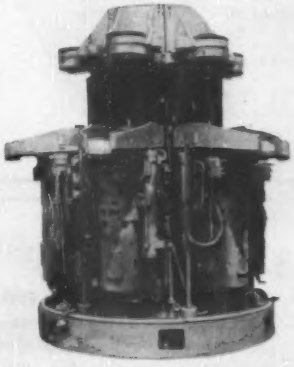

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24", 36", 42" BULLARD Vertical Turret Lathe, New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

1A WARNER & SWASEY Turret Lathe, Heavy Duty, Power Chuck Wrench, Timken Bearing, M.D.

No. 2, No. 3, No. 5, No. 3A WARNER & SWASEY Geared Head Turret Lathes, Bar Feed, Motor Driven.

24"x10' AXELSON Geared Head, Heavy Duty Model "E" 28" Actual Swing, M.D. Taper Attachment. 1942.

No. 7 BARDONS & OLIVER Universal Turret Lathe. 2½" capacity. Preselector Head, Late Type.

12"x18" LIPE-ROLLWAY Semi-Automatic Carbo-Lathe, M.D., 1945.

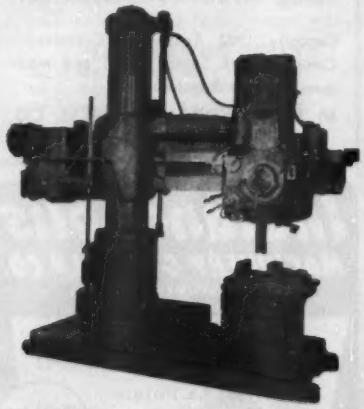
DRILLING MACHINES

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

No. 262 BARNES Motor Driven Sliding Head Drill Press. 2" cap. in steel. 1941.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type. 1943.

No. M200 DEFIANCE Prod. Drill, 2" cap., #5 M.T., 26" swing, 1942.



4' ARM, 15" COLUMN CARLTON RADIAL DRILL. 48 SPINDLE SPEEDS 15-1500 RPM. MOTOR ON ARM. 1943.

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#2-18 CINCINNATI Plain Auto. Milling Machine, M.D. Late Type.

#2 KEMPSMITH Horiz. Maxi-Mill, Motor in base, Vert. Head.

#08 CINCINNATI Vert. Mill, Plain & Rotary Table Type.

#3B KEARNEY & TRECKER Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2 BROWN & SHARPE Vertical Mill, light type, swivel head, M.D., late

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No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

50 HP. CHICAGO PNEUMATIC Air Compresser. Type NSB, 253 CFM, Piston Displacement.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10'x10 ga., 10'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

#7A THOMAS open back Inclinable Press 80 Ton cap. Flywheel M. D. 1948.

600 ton NILES-BEMENT-POND Motor Driven Wheel Press, 86" between strain rods, 14' cap., 17" diam. ram.

#5, #7 JOHNSON O.B.I. Presses. 56, 79 tons cap. M.D. Flywheel & Geared.

No. 6 FEDERAL O.B.I. Press, 65 tons cap. single geared, 4" stroke, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

T-56 VERSON Power Press Brake, 8' overall, late type. 100 Tons Cap. 1942.

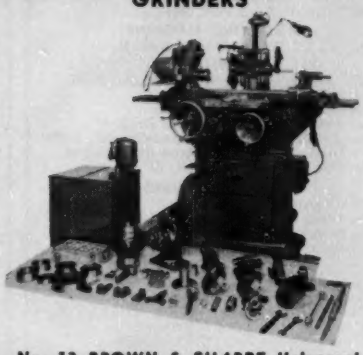
No. 20, WATERBURY FARREL Thread Roller, ⅜" cap., 1944.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

6"x18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

15' x 10' x 36' BETTS PLANER, DOUBLE HOUSING, BOX TABLE, 2 Swivel Heads on Rail; 2 Swivel Side Heads; Pendant Control Variable Speed Main Drive Motor, 75 HP.

GRINDERS



No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder. Full Equipment. 1943.

6"x18" NORTON Vertical Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems, Late.

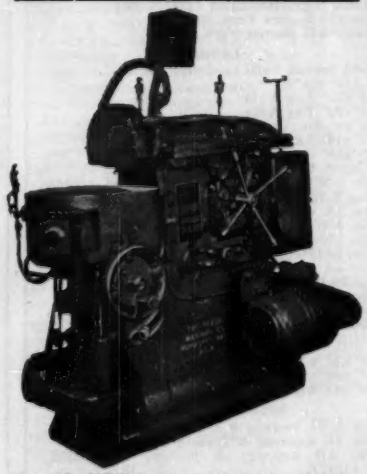
#TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

12" x 24" GALLMEYER & LIVINGSTON Horizontal Hydraulic Surface Grinder, M.D.

No. 14 WD HAMMOND Double and Carbide Grinder, late type.

No. 91A COVEL Universal Tool & Cutter Grinder, M.D., late type.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20", 24", 28" GOULD & EBERHARDT V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

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100" Niles-B-Pond Vert. Bor. Mill.

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No. 3L La Pointe Horiz. Hyd. Broach

DRILLS
4'11" American Hole Wizard Radial Drill.
No. 2 MA-6 Avey 24"-1-Spdl.
2 Spdl.—24" SW.—No. 3 Avey.
No. K60H Fox 16 Spdl. Multi Drill.
No. 2 —20" 2-Spdl. Leland-Gifford LMS
No. LBM—20" 3 Spdl Leland-Gifford Drill.
No. 2MS Allen 3 spdl. drill, 29" swing.

GEAR MACHINES
11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
618-A Fellows Gear Shaper.

GRINDERS
No. 214 Besley Double End Disc Gdr.
5"x30" Cam-o-matic (1946).
6"x18" Norton Type C Plain (1943).
10"x36" Norton Type C Grinder.
10"x48" Norton Type C Pl. (1943).
No. 2—14"x30" Brown & Sharpe Univ. Gdr. (1941)
No. 4 Cinn. Hi-Speed Dial Type Pl. (1944)
No. 2 Cinn. Centerless Gdr. (1944)
TG 616 J & L Thrd Gdr.
B24-25" Chuck Arter Surf.
No. 16-30" Blanchard Rot. Surf. Gdr.
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16 A-28 Bryant Internal Grinder.
No. 16-28 Bryant Int. Gdr.
No. 24-36 Bryant Internal Grinder.
14"x48" Landis Type C. Pl. Gdr. (1942)

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10"x96" Centers. 14"x72" Centers.
18"x96" Centers. 14"x96" Centers.
18"-90" gap x 96" Centers.
18"x120" Centers

HONES
Model H-2 Micromatic Horiz. Hone.
Model 200-H5-Dbl. End Micro. Horiz.
Model H-7 Micromatic Vert. Hone
No. 224 Barnes Vert. Hone
No. 306-H Barnes Vert. Hone.

LATHES
R-14 Seneca Falls Lo-Swing Lathe. (16"x32")
12"x21" Fay Auto.
12"x36" Fay Auto.
18"x6' Am. Geared Head Lathe.
27"x12' American Geared Hd. Lathe.
36"x18' Putnam Grd. Hd. M.D.
No. 1A Warner & Swasey (1942)
No. 2 Warner & Swasey Elect. Head. (1946)
No. 2 Warner & Swasey Geared Head Tur.
No. 2A Warner & Swasey (1943)
No. 3 Warner & Swasey Bar Feed Turret.
No. 5W Acme Tur. Lathe (Late).
No. 3AL Gisholt, Cross-Slide Turret.
No. 4A Warner & Swasey Turret.
3H-10 Libby International, 29" Sw.
No. 4A Warner & Swasey (1944).
No. 7A Jones & Lamson Turret (1942)
No. 4D Potter & Johnston Auto Lathe

PLANERS
48"x36"x14' Gray, 2 Heads.
48"x48"x12' Cincinnati, 2 Heads.
60"x48"x27' American, 4 Heads.

MILLING MACHINES
No. 2-HL Kearny & Trecker Pl. Mill.
No. 3K Kearney & Trecker Vert.
No. 4H Kearney & Tracker Vert. Mill. (1940)
No. 0S Cincinnati Vert. (1942).
10"x48" Hanson-Whitney Thrd. Mill.
10"x60" Pratt & Whitney Thrd. Mill.
12"x102" Mod. HT Lees Bradner Thrd. Mill.
54"x30"x16' Ingersoll Slab Mill.

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Model 61 Excello 6-spindle cyl. borer, 1948
42" Bullard New Era vertical T/L
3½" Bar No. 52 Lucas, horizontal, table type
36" Rogers vert. T/L side head, new 1942
36" Bullard vert. T/L, side head, #11325
72" Niles Bement Pond 2 heads, PRT, #17623

DRILLS, RADIAL
3½ ft. arm 8" column American sensitive
4' arm 13" col. Carlton M.O.B.
9 ft. arm 16" column American, late type.

GEAR HOBBERS
Type A Barber Coleman universal
No. 3 Barber Coleman std (3)
No. 12 Barber Coleman (3)
No. 12H Gould & Eberhardt universal
No. 36H Gould & Eberhardt universal
72" Schuchardt & Schutte universal

GRINDERS, CYLINDRICAL
4"x18" Cincinnati pl. hyd., plunge cut, 1948
6"x30" Norton "C" hyd., 1942.
10"x18" Norton types BA, A C, late models
10"x18" Cincinnati Almatic, type ER (2), 1941-1948
16"x36" Norton type C hydraulic (2), 1943
14"x36" Landis type C, hydraulic (2), 1946
16"x36" Norton type C, hydraulic (2), 1943
16"/26"x72" Norton type C, hydraulic, 1945
18"/48"x120" Landis gap type, hydraulic, serial 18193
18"/48"x96" Landis gap type hydraulic, new 1941
No. 13 Brown & Sharpe universal tool, new 1942

GRINDERS, SURFACE
16A2 Blanchard rotary surface, serial 6046, 1946
6"x18" Norton vert. spdl, hydraulic, 1942
8"x22" No. 3 Abrasive, motor in base
12"x48" Model 300 Hanchett vert. spdl. 1946
14"x36" Pratt & Whitney vertical surface grinder, 1942.
72" No. 72 Hanchett rotary surface, 1946

INTERNAL GRINDERS
Nos. 72, 72A3 and 72A5 Heald
No. 5 Bryant semi-automatic chucking
No. 2 Cincinnati centerless (3), 1942-1943
No. 40 Van Norman radius, 1945

LATHES, ENGINE
14"/28"x36" centers Smith-Drum, gap, 1945.
14"x42" Hendey G.H., M.I.B., 1940
24"x14 ft. bed American G.H., Q.C.G., serial 44070
52"x30 ft. bed Niles Bement Pond G.H., like new

LATHES, MFG. & MISC. & TURRET
17"x72" LeBlond Rapid production (5), 1946-1947
No. H5 Libby International saddle type universal turret lathe, 1940
No. 3 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES
No. 2 Brown & Sharpe vertical
No. 2 Cincinnati Hi-Power plain horizontal
No. 4 Cincinnati Hi-power plain horizontal
No. 5 Cincinnati Hi-power plain horiz., vert. attach.
No. 2-18 Cincinnati production mill, late
No. 4-36 and 4-48 Cincinnati Hydromatic production
No. 3B and 4K Kearney & Trecker plain, late type
No. 22L Van Norman pl. horiz., 1942.
54" Ingersoll 3 spdl rotary, 1940.
24"x24"x12 ft. Ingersoll adj. rail planer type mill, tracer controlled, 1945
30"x30"x12 ft. Ingersoll fixed rail planer type mill
42"x42"x18 ft. Ingersoll adj. rail double housing mill, 2 S.H. and 1 R.H. power on rail and head
42" Ingersoll 3 spindle rotary continuous mill
42" Ingersoll 2 spindle rotary continuous mill
48"x20"x20 ft. Ingersol fixed rail double faced planer type mill
60"x48"x16 ft. Ingersoll adj. rail double housing planer type mill, 2 S.H. and 2 R.H.
72" swing 64" table Ingersoll 2 spindle rotary continuous mill, timken bearings.

PRESSES
500 Ton Baldwin Southwark Hyspeed Hydraulic 1939
600 Ton No. 2316½ Hamilton Forging
750 Ton No. 3 National Maxi-Press
1000 Ton No. 666 Toledo Forging
105 Ton No. 7½ Verson O.B.I. (2)
200 Ton No. 23 Bliss embossing
350 ton No. 1039 Hamilton S.A., D.C.
400 ton No. 605 Toledo knuckle joint
100 Ton No. 93C Toledo SS, DC. air cushion
2 to 70 ton Ferracute punching (several)
3 to 60 ton O.B.I., most every make

SHAPERS & SLOTTERS
24" Gould & Eberhardt ind. universal shaper
32" Gould & Eberhardt Invincible, F.M.D.
36" Rockford vert. hyd. slotter, 1942

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Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.D.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 15' hollow spindle.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 5" Bar Horiz. Boring Mill.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf Grinder 20" chuck.
Campbell No. 213 abrasive cut off 1944.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 42" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt #25 Box. Col. 1-Sp. Hvy. Drill.
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- HP-100 La Pointe 50 Ton Broach, 1945

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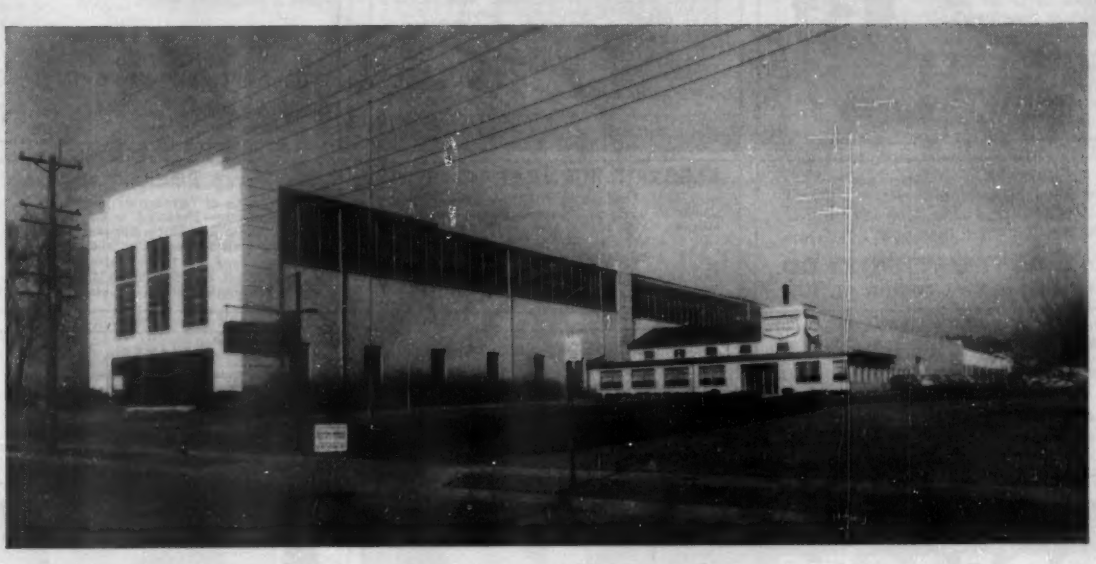

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3'-13" col. Cincinnati-Bickford Super-Service, m.d.
4'-11" col. Morris, m.d. on arm
4'-13" col. Cincinnati-Bickford Plain, m.d.
5'-14" col. Carlton, m.d.
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No. 18 Canedy Otto Bench Model, m.d.
Providence Engineering Co., Model E, s.p.d.
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No. 1B Edlund, m.d., new
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1 spindle Allen, belted m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 3 Allen, belted m.d.
No. 2 LMS Leland-Gifford single spindle, High Speed, m.d.
2 spindle Avey size No. 1 type B, style VHP, m.d., 8" overhang
2 spindle Avey, No. 2, 3 belted m.d., p.f. overhang, m.d.
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Model A—2" Cleveland Single Spindle, late
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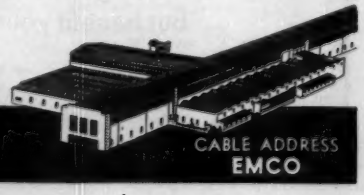

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Niles 38"/44"—With side head—3-jaw chuck table —Threading attachment—MD

DRILLS

Leland-Gifford #2LMS Three-Spindle—Hydraulic feed to two outside spindles—Coolant—Motorized spindles—Late
Leland-Gifford #2LMS Six-Spindle—4 power feed and 2 hand feed spindles—Motorized spindles—3 spindles backgeared—Late

GEAR CUTTERS

Gould & Eberhardt 96"x30" Automatic Spur and Helical—Aux. table—All power feeds—Feed, index and cutter speed gears—MD
Pfauter #5 Automatic Spur, Helical and Worm Gear Generator—Max. cap. 118"x22" face—End milling attachment for herringbone gears—Feed, lead and index gears—MD
Gleason 12" Straight Bevel Gear Generator—Max. pitch dia. 16⅞"—Hydro-screw table drive—MD—Late
(2) Barber-Colman Type A Gear Hobbers—Cap. 12" dia. x 15" cut—MD—1947 machines

MISCELLANEOUS

Johnson Double End Four-Spindle Borematic—Four Excello heads—MD—1943 machine
Jarecki #8 Heavy Duty Pipe Threader—Cap. 2½" to 8"—Cut-off and reaming attachment—Coolant—MD
Pratt & Whitney Single Spindle Three-Dimensional Automatic Duplicator—Type 1736—MD—1952 machine
DoAll Model V-26 and V-36 Contour Shaping Machines—Throats 26" and 36" respectively—Max. work thickness cap. 12" and 10"—MD—Late
Campbell #40! Abrasive Cut-Off Machine—Cap. 6" dia.—MD—Rebuilt and equal to a remanufactured machine

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ACME GRIDLEY R8, 1⅝", 8-spindle; late type
CONOMATIC 1⅞", 8-spindle; M.D., late type
CLEVELAND 3½", Model "A" Single spindle late
CLEVELAND 8", Model "A", single spindle; late
NEW BRITAIN GRIDLEY Model 665; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal

NILES 8" bar; floor type; motor drive
HEALD 40B and 48A single end Boremetic; M.D.
HEALD No. 49 double end Boremetic; M.D.

BORING MILLS—Vertical

BULLARD 8", 8-spindle & 16" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 54" spiral drive, M.D., late type
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES

CINCINNATI I-30 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late
COLONIAL VGI-10-48 Vertical; Hydraulic; late
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Radial

AMERICAN 4' arm 11" col. "Hole Wizard", late
AMERICAN 5' arm 11" col. "Hole Wizard"; late
AMERICAN 5' arm 13" col. "Hole Wizard"; late
CINCINNATI BICKFORD 3' arm 9" col. high speed

DRILLS—Manufacturing

BARNES #282 Heavy Duty Camel Back; late type
BARNES H-2 Hudram; 2" cap.; 22" swing; hydraulic
NATCO B-4-B "Hole Steel" 60 adj. slip spindles
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO C-5 and E-5 high speed, 10 adj. spindles

FELLOWS GEAR EQUIPMENT

FELLOWS No. 6 High Speed Gear Shaper; late type
FELLOWS No. 48 High Speed Gear Shaper; internal cap. 72" diameter; late
FELLOWS No. 61A & 615A High Speed Gear Shaper
FELLOWS No. 6Z2 High Speed Gear Shaper; late
FELLOWS No. 7A and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late

GLEASON GEAR EQUIPMENT

GLEASON 3" Spiral Gear Generator; late
GLEASON No. 4 Tester; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 12 Tool Sharpener; motor drive
GLEASON No. 13 Hyp. Cutter Sharpener; late
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late
GLEASON No. 14 Spiral Bevel Hyp. Gear Grinder
GLEASON No. 17 Spiral Bevel, Zerol and Hypoid Gear Grinder, M.D., late
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No 20 Sour Gear Tester; latest type
GLEASON #22 Hypoid Formate Gear Finisher; late
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 37" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.

CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 8"x18" Model ER Plain, "Filmatic"
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 14"x36" type DC plain hydr. with infeed; late
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type
NORTON 16"x72" type "C" Plain; late type

GRINDERS, Surface

ABRASIVE #54, 6"x24" table; late type
HEALD #22 Rotary, 12" chuck; M.D., late

LATHES, Turret

GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4,#5 ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late
WARNER & SWASEY #2 Geared Head; late
WARNER & SWASEY #3 and #5 Univ. ram type

LATHES, Engine & Mfg.

HENDEY 24"x36" centers; motor drive; late type
LeBLOND 42"x108" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
NILES 30"x10' bed, single end boring, "Time Saver"
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SUNDSTRAND 16"x80" centers; auto Type B; late

MILLING MACHINES, Plain

BROWN & SHARPE #2 M.D. late type
CINCINNATI I-18 Production; Timken; late type
KEARNEY & TRECKER 2H, 2HL, & 4H, M.D., late

MILLING MACHINES, Thread

HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x30" #HT 12"x24" and #HT 12"x36" centers; late type
MOREY 12"x30" and 12"x160" centers; late type

MILLING MACHINES, Universal

CINCINNATI 2MH Univ., motor drive, late type
CINCINNATI #2 Dial Type, Timken, M.D., late
KEARNEY & TRECKER #3K; Timken; late type
VAN NORMAN #22L, #26 and #36 ram type; late

MILLING MACHINES, Vertical

CINCINNATI #4 High Speed Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
CINCINNATI #2 model ER Dial Type; Timken
CINCINNATI #3 Dial Type; High Speed, New 1953
KEARNEY & TRECKER #3H and #4H late type

PLANERS

GRAY 36"x36"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
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BLISS #410A, 525-ton double action toggle drawing press; M.D.
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
SHAW 250-ton Hydraulic flanging press; late
WATERBURY FARREL #9, 125-ton cap., M.D.

SHAPERS

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CINCINNATI 18"; motor drive; hydraulic, late type
CINCINNATI 20"; motor drive; late type
GOULD & EBERHARDT 32"; High Speed; motor drive; late type
MOREY 8" Vertical; motor drive; late type

MISCELLANEOUS

ALEXANDER #2, 3-dim. Engraving NEW 1952
BARNES No. 172 Honing; M.D., hydr.; late
HILLES & JONES #7 Plate Bending Roll; capacity 7/4" x 16"; motor drive
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type
MANVILLE No. 3 Bolt Head Trimmer, M.D.
MANVILLE 2C Screw Slotter, Motor Drive
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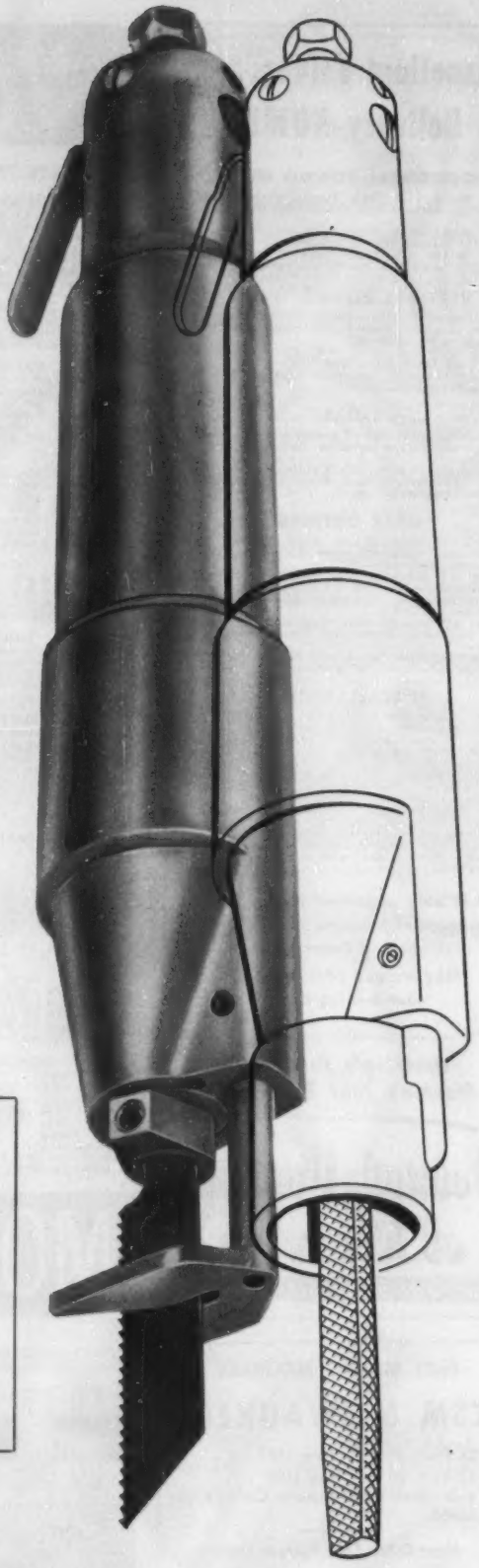

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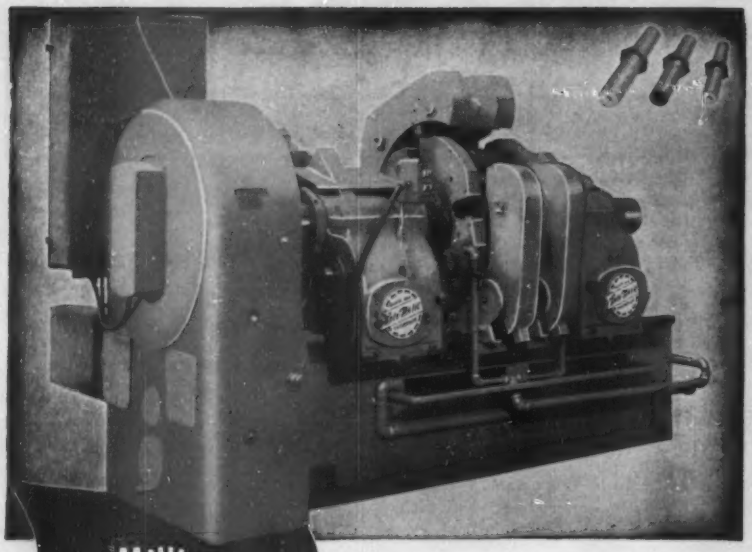

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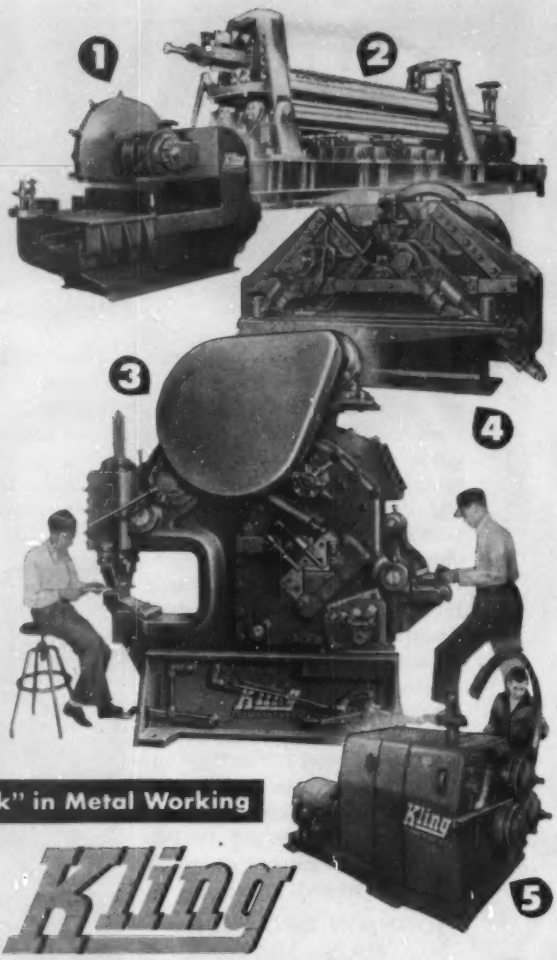

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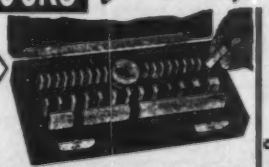

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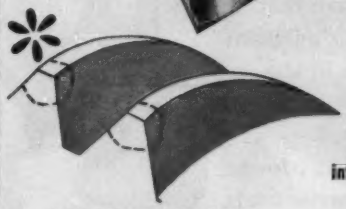

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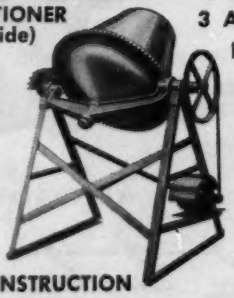

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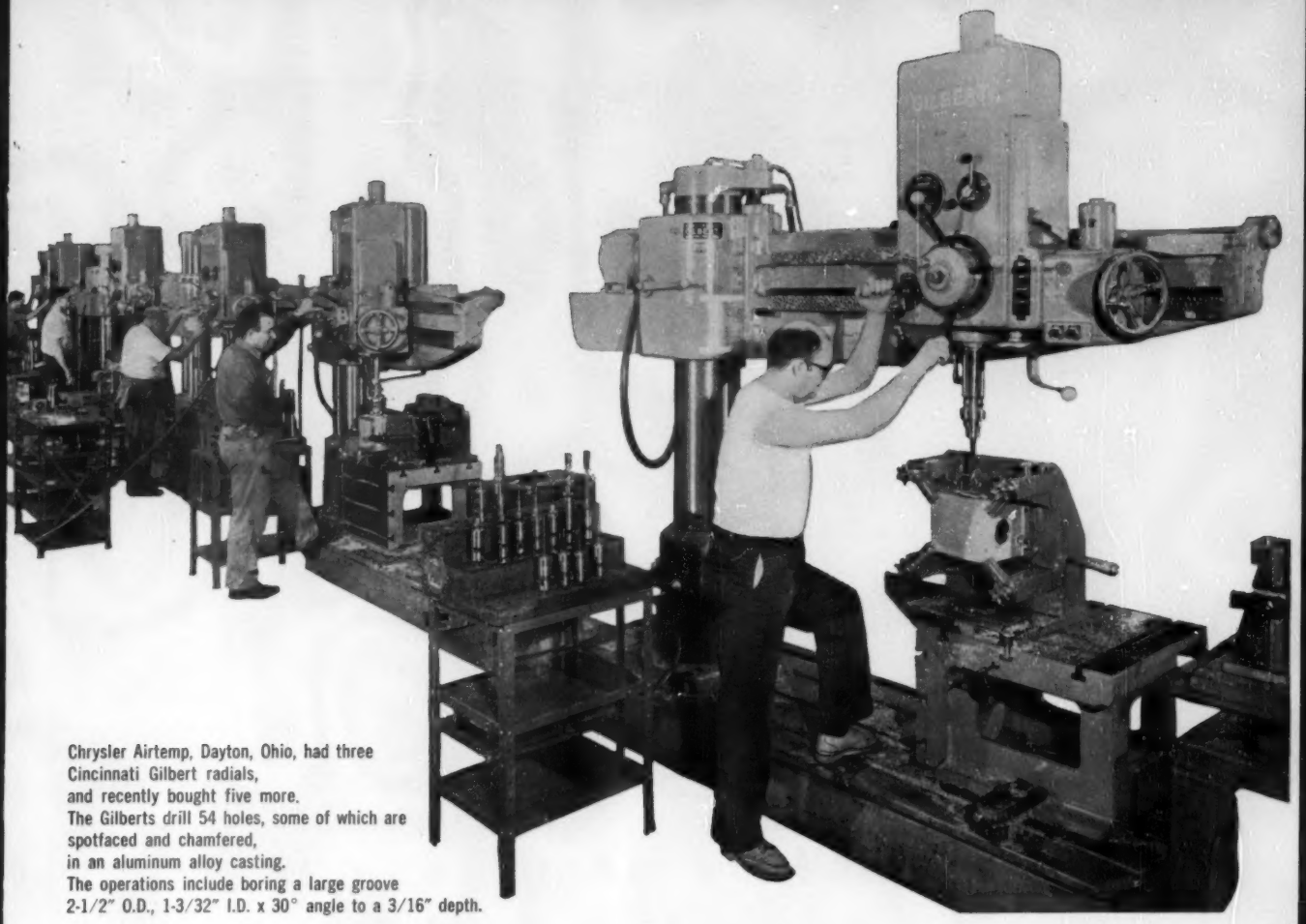

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